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For ZX Spectrum

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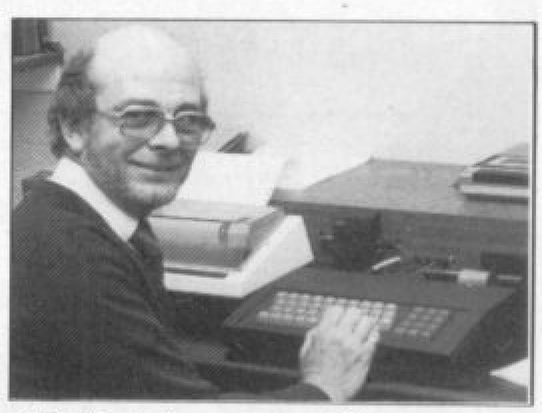
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Going, going, gone?

NINETEEN EIGHTY-FOUR, so far, has been a traumatic year in the software market. In January software publishers forecast a gloomy future for the industry if the epidemic of software piracy was allowed to spread unchecked, predicting that the smaller companies could go to the wall.

It has been suggested that piracy might, however, decrease as an indirect result of the latest upset in the industry — the introduction of cut-price games by a growing number of new publishers who are bringing to an immature market their business expertise gained in other areas.

As reported in last month's *Sinclair User*, the onslaught was spearheaded by two companies, Pulsonic and Mastertronic. In March the former launched a range of cassettes for the Spectrum and Commodore computers priced at an absurdly low £2.95. That price seems almost inflated when compared to that of the Mastertronic games. That company has gone one better than Pulsonic, breaking the £2 barrier and selling its extensive range of titles, which is being added to monthly, at an unprecedented £1.99 each.

Other companies were quick to follow. Atlantis Software matched the Mastertronic price with Spectrum and Commodore games released at the rate of four a month and Advanced Computer Entertainment entered the fray with 10 Commodore titles at £2.99 each, previously sold at £6.90.

Of the four publishers, ACE is the only one to have lowered the price of existing software; the others are all newcomers to the industry which are launching new products. Yet all four have more in common than just their pricing policies. They have approached the market with a wealth of experience accumulated in the parallel home entertainment industries of records and videos.

The Pulsonic cassettes come from the same stable, Warwick Leisure, which produces the budget albums found in chain stores such as Woolworth. Two of the Mastertronic directors own the video wholesalers Video Tapes International, while Atlantis Software is brought to you courtesy of Atlantis Video Productions, distributor of such horror movies as *Nightmare Maker, One Dark Night* and *Plague.* ACE is another distributor of low-cost video tapes.

Each company has carefully considered the software market and reached the same conclusions — that the games on the market to date have been over-priced and consequently have not achieved volume sales. The manufacturers have labelled the low-priced games 'pocket-money software' assuming, no doubt correctly, that most computer games players are children who cannot afford to buy even one £6.99 cassette a week. The new pricing, it is hoped, will encourage impulse buying and to that end the cut-price games are being distributed through a number of previously unused outlets such as newsagents, garage forecourts, supermarkets and off-licenses. A far cry from the small ads where most of the long-established software houses cut their teeth.

The strategy is paying off already; within three weeks of launch Mastertronic claimed that sales exceeded 150,000 games — more than some software houses sell in a year.

The reaction from the industry was swift and predictable. Derek Meakin, head of the National Micros Centres, summed up the mood when he stated in April: "Many of the software houses are working on very tight margins already and a price-cutting war could well bankrupt the more vulnerable ones." He suggested that the freelance software writers would be among the first to feel the pinch and they would be reluctant to work for months producing a first-class program for meagre royalties. "Standards will slide rapidly," Meakin predicted, gravely.

Many of the protestors have cited the case of Imagine Software, which announced a price drop in March but pulled back at the eleventh hour. The decision was taken, the company claimed, "after much soul-searching and to safeguard the growth of the software industry in its widest sense." Such magnanimity, it is argued, should set an example to the quick-buck merchants who might, unwittingly, kill the hen which lays the chuckie eggs.

Is there any justification in those fears and are we about to witness the collapse of civilisation as we know it?

To begin with let us look at the cut-price games themselves. Most of the them are, to be blunt, fairly dire. Of the games received at *Sinclair User* only a few can be considered better than average, while most are tired variations on well-worn themes, unashamed arcade derivatives. The titles are sufficient to confirm your worst suspicions — **Spectipede, Gnasher, Monster Munch.** Games like those have been around longer than we care to remember, but there is one difference and that is crucial. In the past such mind-numbing pastimes cost £6 or more.

The companies which have most to lose, then, are those which have been producing sub-standard software at exorbitant prices and getting away with it for far too long. The only alternatives open to them now, if they want to survive, are to lower prices or improve quality. Standards will not drop because standards were never that high to begin with, only the prices were.

> 'In most respects, pocket-money software is good news for the industry'

On the other hand, publishers who have always guaranteed value for money need not be over-concerned about the pocket-money software. Programs like **Jet Set Willy, Scuba Dive, The Hobbit, Halls of the Things, 3D Ant Attack** and many others will continue to sell in sufficient numbers to justify the time and effort spent on their production.

Neither should educational and business software houses worry too much, for it is extremely unlikely that Pulsonic, Mastertronic and the rest will compete in those areas.

Will volume sales succeed in making software piracy less attractive, as counterfeiters find they are unable to guarantee reasonable profits? Sadly, that is not likely to be the case, because pirates will continue to concentrate on copying the most popular games — the Manic Miner and Jet Set Willy chart-toppers.

In most other respects, however, pocket-money software is good news for the industry. It will force publishers to keep on their toes, it should lead to marked improvements in quality, and it will ensure that users will no longer feel cheated when they have paid through the nose for a Pac-man lookalike which palls after half-an-hour.

A guide to getting better pictures

First-class monitors

WE HAVE received several enquiries recently about connecting a colour monitor to the Spectrum. On the face of it, that is a simple task but things are not so straightforward as they seem.

A monitor should provide a better picture than a television. The video signals used inside your television and at the television studios cannot be broadcast directly. They need to be converted to radio waves at the transmitter and back again inside your set. That is called modulation and demodulation. Similarly, your Spectrum has to modulate the video signals it produces to be able to feed them into the aerial socket. That process causes degradation of the video signal.

Monitors are designed to accept video signals directly. Some require an RGB — red, green, blue — signal; others need what is called a composite video signal. You must ensure that the monitor you choose to connect to a Spectrum can accept a composite video input.

The edge connector at the back of the Spectrum has signals labelled VIDEO and 0V. On early Spectrums the VIDEO pin was not connected internally and those models require an internal link to be fitted before that signal can be used. Even with the link installed, the video signal available at the connector is so degraded by electrical noise that connecting a monitor at that point usually gives an inferior picture to that obtained on the usual television/modulator arrangement. Later models do not require that link but the picture is even worse than on the earlier issues.

The difficulty can be resolved by connecting the monitor lead directly to the input of the modulator. If the Spectrum is less than 12 months old, the guarantee will be invalidated as it requires removal of the keyboard while soldering is taking place.

There may be an added bonus. In addition to the marked improvement in the quality of the picture some monitors also provide a sound input. That lead can usually be soldered to the back of the earphone or microphone sockets at the same time as the video lead is connected to the modulator, transforming the normal strangled beep of the Spectrum into a more powerful and controllable sound.

If you would like to connect a monitor to your Spectrum, why not take advantage of the offer below?

CLUB BENEFITS

Bi-monthly club cassette available to all members.
Special discounts on hardware, software and books.
Members recover their membership fee many times over.
Free Club software.
Machine code teach-in.
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Jet Set Willy special offer

IF YOU BUY a Fidelity CM14 colour monitor at the Club price of £189, plus £9.50 for the connector, the Club will fit the set with the Spectrum lead for an extra £4.50.

This month's software offers are for the Spectrum and ZX-81. **Jet Set Willy** and its predecessor **Manic Miner** are just two of the star items on offer. If you get Willy through one adventure there is always the other one to conquer.

The ZX-81 is not forgotten. **Defenda** is one of the best versions of the arcade game Defender for the computer. **Hopper** and **Crazy Kong** are also best-selling versions of famous arcade games.

All the offers can be obtained only by members of the Club and are available until the end of July. If you are not a member but want to join this month, you can take advantage of the offers by sending an order form with your membership fee.

	List price	Offer price
Hardware		
Fidelity CM14		
Colour monitor +	**£199.95**	**£189**
Connector		**£9.50**
Spectrum software		
Jet Set Willy	**£5.95**	**£4.99**
Manic Miner	**£5.95**	**£4.99**
Tribble Trubble	**£5.95**	**£4.99**
Orion	**£5.95**	**£4.99**
Ometron	**£5.95**	**£4.99**
Push Off	**£5.95**	**£4.99**
Thrusta	**£5.95**	**£4.99**
ZX-81 software		
QS Defenda	**£3.95**	**£2.99**
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Krazy Kong	**£4.95**	**£3.99**

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Britain

Aylesbury Computer Club: 12 Long Plough, Aston Clinton, Aylesbury, Bucks.

Aylesbury ZX Computer Club: Ken Knight, 22 Mount Street, Aylesbury (5181 or 630867).

Basildon: Roundacre Microcomputer Users' Club. J Hazell, Basildon 285119/416333. Meetings every Wednesday 7.30 to 10.30pm.

Bristol Yate and Sodbury Computer Club: 99 Woodchester Yate, Bristol, BS17 4TX.

Cardiff ZX Club: Steve Smith (0222) 593237 or Mike Hayes (0222) 371732. Meets twice a month.

Colchester Sinclair User Group: Richard Lown, 102 Prettygate Road, Colchester CO3 4EE.

Cornard Sinclair User Group: Neil MacDonald, 15 Potkiln Road, Great Cornard, Sudbury, Suffolk CO10 0DA.

Crewe and Nantwich Computer Users' Club: J E A Symondson, 46 London Road, Stapeley, Nantwich, Cheshire CW5 7JL.

Daventry & District Computer Club: c/o Daventry Ex-servicemen's Club, Market Square, Daventry, Northants.

Doncaster and District Micro Club: John Woods, 60 Dundas Road, Wheatley, Doncaster DN2 4DR; (0302) 29357.

Eastwood Town Microcomputer Club: E N Ryan, 15 Queens Square, Eastwood, Nottingham NG16 3BJ.

Edinburgh: Edinburgh Home Computing Club. John Palmer (031 661 3183) or Iain Robertson (031 441 2361).

EZUG-Educational ZX-80-81 Users' Group: Eric Deeson, Highgate School, Birmingham B12 9DS.

Furness Computer Club: R J C Wade, 67 Sands Road, Ulverston, Cumbria (Ulverton 55068). Meets every other Wednesday.

Glasgow ZX-80-81 Users' Club: Ian Watt, 107 Greenwood Road, Clarkston, Glasgow G76 7LW (041 638 1241).

Gloucester: Mid-weekly Spectrum User Group. Barry Ledbury, 8 Linnet Close, Gloucester GL4 9XA (0452) 23186.

Gravesend Computer Club: c/o The Extra Tuition Centre, 39 The Terrace, Gravesend, Kent DA12 2BA. Bi-monthly magazine and membership card.

Hassocks ZX Micro User Club, Sussex: Paul King (Hassocks 4530).

Inverclyde ZX-81 Users' Club: Robert Watt, 9 St. John's Road, Gourock, Renfrewshire PA19 1PL (Gourock 39967). Meets every other Monday at Greenock Society of the Deaf, Kelly Street, Greenock.

Keighley Computer Club: Colin Price, Redholt, Ingrow, Keighley (603133).

Lambeth Computer Club: Robert Barker, 54 Brixton Road, SW9 6BS.

Liverpool ZX Club: Meetings every Wednesday 7pm at Youth Activities Centre. Belmont Road, Liverpool 6. Keith Archer, 031-236 6109 (daytime).

Manchester Sinclair Users' Club: Meets every Wednesday, 7.30pm, at Longsight Library, 519 Stockport Road, Longsight — 061-225 6997 or 061 445 6316.

Meopham: National ZX Spectrum User Club. Guy Fullalove, Woodcotes, Camer Park, Meopham, Kent DA13 0XS. Bi-monthly newsletter, subscription £1.50. Send SAE for details.

Merseyside Co-op ZX Users' Group: Keith Driscoll, 53 Melville Road, Bootle, Merseyside L20 6NE; 051-922 3163.

Micro Users' Group: 316 Kingston Road, Ewell, Surrey KT19 0SY.

Mid-Kent Micro Club: Meets once monthly. Enquiries to M Gates, 65 Buckland Road, Maidstone ME16 0SH.

Newcastle (Staffs) Computer Club: Meetings at Newcastle Youth and Adult Centre, Thursday, 7.30. Enquiries to R G Martin (0782 62065).

North Hertfordshire Home Computer Club: R Crutchfield, 2 Durham Road, Stevenage; Meetings: first Friday of the month at the Settlement, Nevells Road, Letchworth.

Northern Ireland Sinclair Users' Club: P Gibson, 11 Fitzjames Park, Newtownards, Co Down BT23 4BU.

North London Hobby Computer Club: ZX users' group meets at North London Polytechnic, Holloway Road, London N7 Monday, 6pm.

Nottingham Microcomputer Club: ZX-80-81 users' group, G E Basford, 9 Holme Close, The Pastures, Woodborough, Nottingham.

Orpington Computer Club: Roger Pyatt, 23 Arundel Drive, Orpington, Kent (Orpington 20281).

Perth and District Amateur Computer Society: Alastair MacPherson, 154 Oakbank Road, Perth PH1 1HA (29633). Meetings: third Tuesday of each month at Hunters Lodge Motel, Bankfoot.

Regis Amateur Microcomputer Society: R H Wallis, 22 Mallard Crescent, Pagham, Bognor Regis, West Sussex PO21 4UU.

Roche Computer Club: 8 Victoria Road, Coop Rooms, Roche, Cornwall: 0726 890473. Twice weekly meetings, Monday and Friday.

Scunthorpe ZX Club: C P Hazleton, 26 Rilestone Place, Bottesford, Scunthorpe; (0724 63466).

Sheffield: South Yorkshire Personal Computing Group. R Alderton (0742 20571), S Gray (0742 351440), P Sanderson (0742 351895).

Sinclair Amateur Radio User Group: SAE or two IRCs for details. Paul Newman G4 1NP, 3 Red House Lane, Leiston, Suffolk IP16 4JZ.

Sittingbourne: Anurag Vidyarth (0795 73149).

St Albans: Bi-monthly meetings and a magazine. Details from Adam Slater, 40 Watford Road, St Albans, Herts AL1 2HA. (0727 54176).

Stratford-on-Avon Computer Club: Meets on the second Wednesday of every month. Telephone: 0789 68080 for details.

Swansea Computer Club: B J Candy, Jr Gorlau, Killay, Swansea (203811).

Swindon ZX Computer Club: Andrew Bartlett, 47 Grosvenor Road, Swindon, Wilts SN1 4LT; (0793) 3077. Monthly meetings and library.

Sutton: Sutton Library Computer Club, D Wilkins, 22 Chestnut Court, Mulgrave Road, Sutton, Surrey SM2 6LR.

West Sussex: Midhurst and District Computer User Group. Enquiries to V Weston (073 081 3876), R Armes (073 081 3279).

Worle Computer Club: S W Rabone, 18 Castle Road, Worle, Weston-super-Mare BS22 9JW (Weston-super-Mare 513068).

Universal ZX Club: Postal club for Spectrum owners in the U.K. and abroad. C. Shaw, 1 Swiss Walk, Batley, W. Yorkshire.

ZX-Aid: Conrad Roe, 25 Cherry Tree Avenue, Walsall WS5 4LH. Please include sae. Meetings twice monthly.

Overseas

Australia: ZX Users' Association, 19 Godfrey Street, Campbell, ACT, 2601, Australia.

Austria: ZX User Club, Thomas Christian, c/o Wissenschaft Forscht e. V., Postfach 141, A1190 Vienna. Meets every first Friday of the month. Telephone 0222-44 32 050 for details.

Belgium, France and Luxembourg: Club Micro-Europe, Raymond Betz, 38 Chemin du Moulin 38, B-1328 Ohain, Belgium (32/2/6537468).

Denmark: Danmarks National ZX-8081 Klub (DNZK), Jens Larson, Skovmosevej 6.4200 Slagelese, post giro 1 46 24 66.

ZZ-Brugergruppen i Danmark, Boks 44, 2650 Hvidovre, Gratis medlemskab og gratis blad til enhver interesseret.

J Niels-Erik Hartmann, OZ-ZX-Radioamator, Bruger Gruppe, Bredgade 25 DK-4900, Nakskov.

East Netherlands: Jonathon Meyer, Van Spaen Straat 22,6524 H.N. Nijmegen; (080 223411).

Germany: ZX Club, a postal club; contact Aribert Deckers, Postfach 967, D-7000 Stuttgart 1, West Germany.

Indonesia: Jakarta ZX-80/81 Users' Club, J S Wijaya, PO Box 20, Jkukg, Jakarta, Utara, Indonesia.

Irish Amateur Computer Club: Martin Stapleton, 48 Seacourt, Clontarf, Dublin 3. (331304).

Irish Sinclair Users Club: PO Box 1238, Dublin 1. Publishes a newsletter. Send SAE for details.

Italy: Sinclair Club, Via Molino Vecchio 10/F, 40026 Imola, Italy.

Genova Sinclair Club; Vittorio Gioia, Via F Corridoni, 2-1, telephone 010 3125 51.

Micro-Europe: Belgium or Club Paris-Micro, 19 Rue de Tilly, 92700, Colombes, France; associated with Club Micro-Europe.

Republic of Ireland: Irish ZX-8081 Users' Club, 73 Cnoc Crionain, Baile Atha, Cliath 1.

Singapore: Sinclair Users' Group: Eric Mortimer, 1D Wilmer Court, Leonie Hill Road, Singapore.

South Africa: Johannesburg ZX-80-81 Computer Users' Club: S Lucas, c/o Hoechst SA (Pty) Ltd, PO Box 8692, Johannesburg.

Johannesburg ZX Users' Club: Lennert E R Fisher, PO Box 61446, Marshallstown, Johannesburg.

Dumont and Syndercombe Amateur Computer Club. Jean-Pierre Dumont would like to correspond with ZX-81 owners via tapes. Write to 8 Kipling Road, Farrarmere, Benoni 1500, Transvaal.

ZX SA Club: Jonathan Jones, House 14, Anglo Alpha PO Box 15, 1725 Roodepoorf.

Spain: Club Nacional de Usuarios del ZX-81, Joseph-Oriol Tomas, Avda. de Madrid, No 203 207, 10, 3a esc. A Barcelona-14 Espana.

International ZX Spectrum Club: Gabriel Indalecio Cano, Sardana, 4 atrico 2a, San Andres de la Barca, Barcelona. Send international reply coupon. Produces a bi-monthly magazine. Spanish ZX Micro Club: Apartado 181, Alicante (Costa Blanca), Spain.

ZX Club Spain; C Benito PO Box 3253, Madrid, Spain.

Swedish ZX-club: Sinclair Datorklubben, Box 1007, S-122, 22 Enskede.

United States: Bay Area ZX-80 User Group, 2660 Las Aromas, Oakland CA94611.—Harvard Group, Bolton Road, Harvard MA 01451: (617 456 3967).


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KEMPSTON
KEMP 1

ZX printer discontinued

THE ZX PRINTER, brought out by Sinclair Research when it launched the ZX-81 three years ago, has been discontinued.

A spokeswoman for Sinclair Research says: "We feel that the printer has reached the end of its useful life. We were selling only thousands and sales have fallen."

Sinclair Research has a limited number of printers in stock which it will continue to sell. People who already own a printer have no need to worry, as the company still intends to supply the silver paper which goes with it.

Spectrum famine

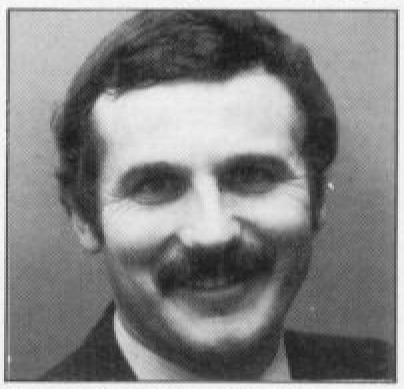
SINCLAIR RESEARCH has finally admitted that insufficient Spectrums are being made. For months, in the teeth of fierce criticism from retailers, some unable to obtain a single machine since September, the company has maintained stoutly there was no problem. Now it has discovered what everyone else knew in January. Spokesman Bill Nichols says:

"The shortage is due to an incredible sustained demand for Spectrums". He adds that production of Spectrums has reached at all-time high but conceded that it is still falling well short of demand.

Some areas of the U.K. have suffered particularly badly from the shortfall. Sinclair Research is not directly responsible for regional variations but Nichols says: "There are Spectrums around; it is unfortunate if they are not available in some areas."

While the situation is changing constantly and some supplies have been arriving, the confidence of small retailers has been severely shaken. Few expect deliveries on a regular stable basis for the foreseeable future.

Their difficulty has been exacerbated by the high percentage of returns of the issue three Spectrum. Some retailers put the figure as high as 40 percent of machines sold and those have had to be replaced from stock, where stocks were available.



Bob Denton: returns 'horrific'.

Bob Denton, managing director of Prism Technology Holdings, the major Spectrum distributor, says: "The number of returns is horrific".

Sinclair Research was unable to confirm the true figure but has promised to improve quality control on future production and clearly is concerned about the problem. If the figures quoted by retailers are anywhere near to being accurate then, considering the shortage of new machines, there must be hundreds of customers with Spectrums still under guarantee who have been unable to obtain replacements.

Nichols is anxious to point out that the increased number of machines exported overseas had not affected the U.K. "Supply is as great or greater for the U.K. market".

more news on page 15

Successful detectives

THE Sherlock Holmes puzzle in the April issue of *Sinclair User* generated the best-ever response to a competition in the magazine, with more than 18,000 entries received. The first five correct entries taken from the postbag were from:

Skorkovsky Jarohir, Czechoslovakia; Mrs M C Mackintosh, Milton Keynes, Bucks; Manoj Mehta, Stoke-on-Trent, Staffs; David Cookson, Withernsea, N Humberside; and John Rew, Bo'ness, West Lothian.

The 25 runners-up were: M J Leah, Rugby; Stuart Taylor, Solihull, West Midlands; G V R Howard, Windsor, Berkshire; John Waldron, Melton Mowbray, Leicestershire; Simon Mutton, Haverford West, Dyfed; Jane Allan, Newlands, Glasgow; Alan Taylor, Sheffield; Tim Smalley, Herne Bay, Kent; Keith Punshon, Torquay, S Devon; Michael Beaven, Mansfield, Nottinghamshire; John Cowley, Crowborough, E Sussex; Ronald Cook, Anfield, Liverpool; D Warner, Ferndown, Dorset; R Lanchbery, Carlisle, Cumbria; Val Keith Hoy Brackley, Hilleroed, Denmark; M J Rutter, Surbiton, Surrey; David Bowler, Peterborough; Lewis Tyrell, St Leonards-on-Sea, E Sussex; Martin McShane, Fairfield, Liverpool; David Sced, Rugby; Byron Peter, London W11; Paul Baker, Barking, Essex; Richard Stent, Bovey Tracey, S Devon; Christopher Hand, Basford, Nottingham; and I D Barker, Redcar, Cleveland.

Spectrum Top Ten

	Program	Last Month	Company	Memory
1	Jet Set Willy	1	Soft Proj.	48K
2	Fighter Pilot	—	Digital Int.	48K
3	Chequered Flag	—	Psion	48K
4	Blue Thunder	2	Willcox	48K
5	Cricket Captain	—	Allanson	48K
6	Pogo	5	Ocean	48K
7	Gnasher	8	Mastertronic	16K
8	Bullseye	—	Mastertronic	48K
9	Wheelie	—	Microsphere	48K
10	Atic Atac	10	Ultimate	48K

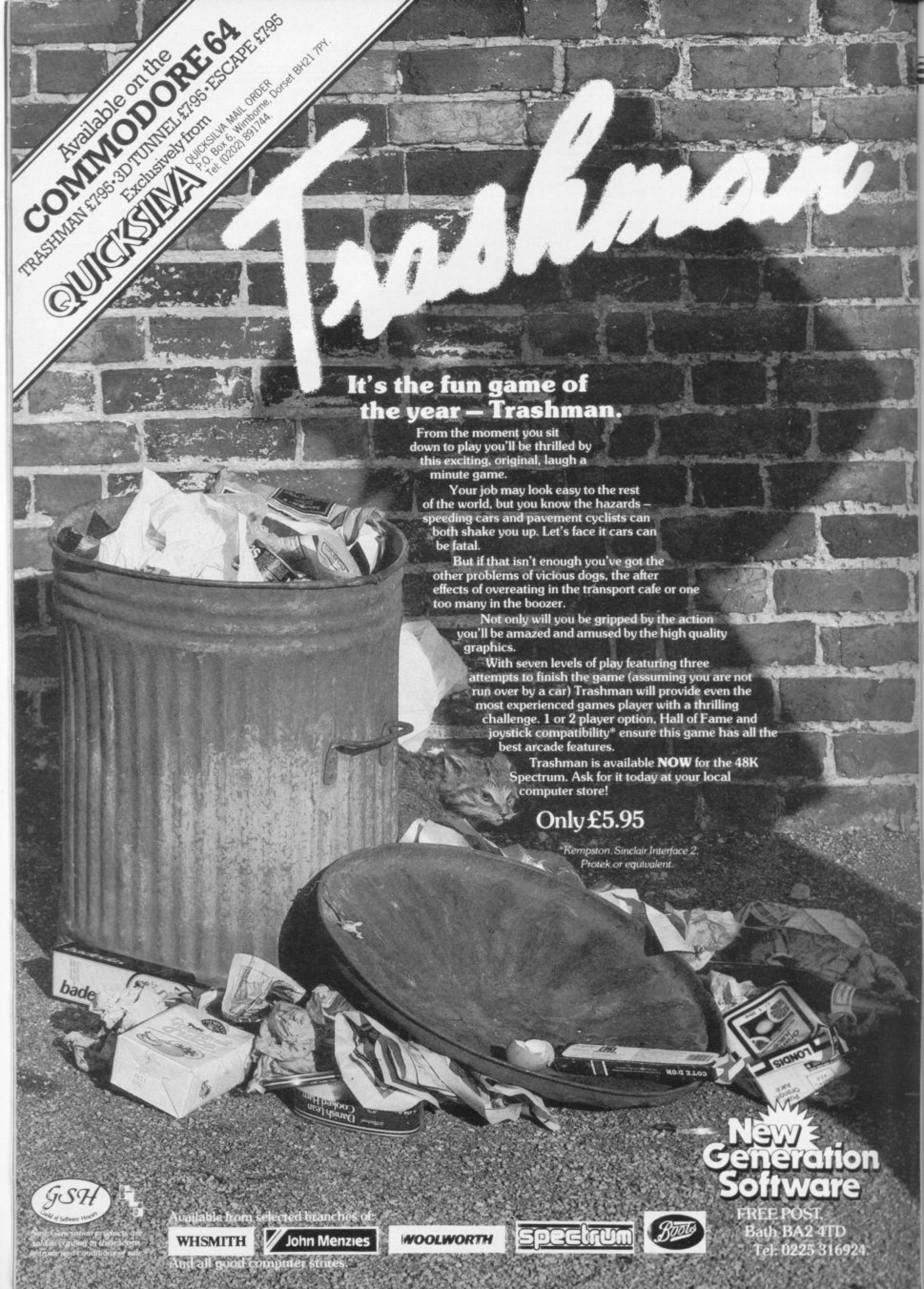
Figures supplied by **W H Smith**

Battle 1917 errors

BATTLE 1917 in the May issue of *Sinclair User* has caused some problems because the colours of the armies were not displayed. To remedy that some colour codes need to be added to the lines listed below. In order to insert the colours: (a) retype the line until you get to a graphic character; (b) go into extended modes; (c) hold CAPS SHIFT down and press the key for the appropriate colour eg. 2 for red. The cursor should then change colour; (d) Go into graphics mode and press the graphics letter that appears on the current line; (e) Once you have the letter in the required colour leave graphics mode; (f) press CAPS SHIFT and key '0'. The cursor will then return to its black colour and you can continue typing until the next graphics letter.

Line	Graphic letter	Colour
117	H	green
126	I	blue
610	K	red
630	J	blue
640	J	blue
2900	F	red
	F	blue
2910	F	red
	F	blue
7000	A, B, C, C, E, F	blue
	A, B, C, C, E, F	red

To LOAD both listings concurrently omit line 9888 from the instructions listing. The 'I' in line 4468 of the main listing should be entered in graphics mode.


Available on the
COMMODORE 64
TRASHMAN £7.95 · 3D TUNNEL £7.95 · ESCAPE £7.95
Exclusively from
QUICKSILVA
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Tel: (0202) 891744.
Trashman
It's the fun game of
the year – Trashman.
From the moment you sit down to play you'll be thrilled by this exciting, original, laugh a minute game.
Your job may look easy to the rest of the world, but you know the hazards – speeding cars and pavement cyclists can both shake you up. Let's face it cars can be fatal.
But if that isn't enough you've got the other problems of vicious dogs, the after effects of overeating in the transport cafe or one too many in the boozer.
Not only will you be gripped by the action you'll be amazed and amused by the high quality graphics.
With seven levels of play featuring three attempts to finish the game (assuming you are not run over by a car) Trashman will provide even the most experienced games player with a thrilling challenge. 1 or 2 player option, Hall of Fame and joystick compatibility* ensure this game has all the best arcade features.
Trashman is available NOW for the 48K Spectrum. Ask for it today at your local computer store!
Only £5.95
*Kempston, Sinclair Interface 2, Protek or equivalent.
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spectrum
Boots
And all good computer stores.

Sinclair hype wins

SINCLAIR RESEARCH has been voted the most admired electronics company in the U.K. in a poll of company directors in the industry. Sinclair was top by a large margin, winning a quarter of the first-place votes and leaving Racal, Plessey, GEC and other giants struggling among the foothills.

According to *Technology and Marketing* magazine, which carried out the survey, Sinclair was most admired for low prices, innovation, and 'good marketing hype'. It is intriguing that the authors say most of the votes were recorded before the launch of the QL and they suggest the winning margin might otherwise have been even greater.

By way of contrast, a parallel poll in the U.S. voted overwhelmingly for IBM. "Simply the best in the world" was the verdict of one participant.

Move from Microdeal to stop software piracy

THE WAR against piracy is escalating as software houses join forces to combat the growing number of outfits selling cheap versions of games stolen from software companies.

In the forefront of the campaign to break the pirate operations are Microdeal and Quicksilva, both members of the Guild of Software Houses, which has set up a committee to co-ordinate action against the pirates.

Microdeal issued a press release containing a photocopied letter alleging that a user club was a 'front' for a pirate operation. The letter used violently emotive language to describe the club organiser and alleged that he worked for a computer publication, using review copies to duplicate games to sell them through the club.

Microdeal has informed the police, who are said to be making inquiries; meanwhile the man concerned denies the allegations and says any software distributed by the club is second-hand. He told us he could not comment further as he was considering what action he should take. The publication named in the letter also denies that he works for that magazine.

Microdeal suggests that magazines should cease to print advertisements for user groups to prevent what it believes to be serious piracy. GOSH does not share this view, feeling that a more appropriate response is to encourage links between user groups and software companies which might range from discount software offers to lectures on aspects of the industry, thus creating an atmosphere in which the anti-piracy message can be communicated effectively.

"We certainly do not want a blanket ban on user groups", says Mike Johnston, secretary of GOSH. "Many user groups perform a useful service. Microdeal is acting on its own initiative in this case, which is in no way officially sanctioned by GOSH."

The recently-formed Software Registry is another organisation which feels that rushing in with heavy boots is not the most appropriate way to deal with piracy at that level.

The Software Registry is a profit-making concern, offering insurance against legal expenses to aid subscribers in bringing cases against pirates. Managing director Cliff Sturt says the main threat is from professional pirates, who are turning to computer software for the pickings available. He feels the law contains sufficient scope to prevent piracy but that companies are not taking advantage of its provisions.

Users club together before QLs arrive

PEOPLE interested in the QL are already meeting to share their experiences of a machine which they may have seen only at a distance. There is already a training course for QL owners and at least two user groups.

The Independent QL Users' Group produces a newsletter, *Quanta*. The information in the pages of the first few issues was not exactly fiction but the 19 pages of editorial could have been fitted into half that amount.

The group is well-organised and has even tried to get on to Micronet and Prestel. People wishing to join should contact Brian Pain, 24 Oxford Street, Stony Stratford, Milton Keynes.

The QL Club provides an even more flexible service, offering cut-price peripherals, insurance and a newsletter to members. Anyone who wants to join the club should write to ICL, Freepost, Wrexham, LL13.

The first training course for the owners of the new Sinclair machine has just been started by Owl Business and Computer Consultants. The courses will cover a general introduction to the machine and then deal with use in the home and office applications such as word processing, spreadsheet, database and graphics.

Details of other courses can be obtained from Elayne Coakes, Principal of Owl Computer Training, tel: 044 282 7302.

The Advance in high technology

W H SMITH has announced the launch of a new personal computer designed by Advance Technology, the Advance 86. The machine is intended to appeal to the home user and to small businesses.

There are two versions. The 86A has 128K RAM with 16K of video RAM, expandable to 256K. The system is based,on the Intel 8086 chip, a 16-bit processor, and includes provision for using either a television or monitor. There are also ports for a Centronics printer, joysticks and cassette recorder. The 86A will sell for £399, while the model B, which includes two disc drives, expansion slots, and software, will cost £1,499.

Smiths will be the only stores to sell the machines. If true, that will be a particularly attractive sales feature, although in the past IBM has resisted such moves by altering the specifications of its machines.

W H Smith says that in spite of the similarities of price and specifications, the Advance is not intended as direct competition to the Sinclair QL. "We have very cordial relations with Sinclair Research", a spokesman said.

more news on page 16

Pre-production paperbacks

PAPERBACK publishers have caught QL fever and some have even produced books before the machines have reached customers.

Pitman, famous for its shorthand and computer guides, was first to issue a book about the QL, *The Sinclair QL Companion,* by Boris Allan.

The book has been written using a pre-production model. A spokesman for Pitman says: "The book has gone to retailers and we are confident that we will get a good return. We were the first on to the market with a QL book and that should give us a lead over other publishers. If there are any changes to be made in the text they will be done when we reprint it."

The first copies of the book included an unusual message to readers. "The author and publisher cannot accept responsibility for any loss or other inconvenience caused by failure of the material printed in this publication to correspond to the operation of the Sinclair QL computer or of its constituent parts".

Pitman was followed closely by Hutchinson which has announced a series of books on the QL to be edited by Robin Bradbeer.

There are six books in the series to be published in July and August. They include an introduction to the QL and SuperBasic, advanced SuperBasic programming, word processing and desk-top computing. One of the books is to have a foreword by Nigel Searle, managing director of Sinclair Research.

A spokeswoman for Hutchinsons Books. says: "We are launching books in July and August because we want to see a finalised QL before we print anything. Books which were published before the QL went to customers are obviously prone to error."

Duckworth Books is also launching a QL title. The aim is to give users an introduction to the machine and take them to an advanced stage in programming.

W H Smith is steeling itself for the approaching onslaught of QL books. A spokeswoman says: "We have one book in stock at the moment — *The Sinclair QL Companion.* We want to take as many titles as we can but we will take them only when we have seen the finished work."

The complete Clive—warts and all

THE OFFICIAL biography of Sir Clive Sinclair and his succession of high technology companies is to be told in *The Sinclair Story.*

The publishing rights to the biography have been purchased by Duckworth Books and the new title is to be launched in October.

The author, Rodney Dale, has full access to the Sinclair Research files and is interviewing dozens of people who have been associated with Sinclair during his rise to fame.

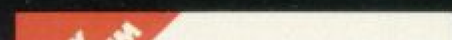
Dale has known Sinclair for more than 20 years but, despite their friendship, Sir Clive wants the story to be told 'warts and all'.



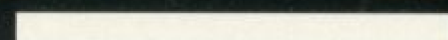
TWO NEW RELEASES FROM CRYSTAL

IT'S THE WOOLUF!

TUBE WAY ARMY



Written by: Martin Buller



Written by: Rainbow Software

From the creators of 'Halls of the Things,' 'Invasion of the body snatchas,' and many other software classics come these exciting new games.
Games to tax your judgement and puzzle and frustrate you for months on end.
Don't forget our other titles, which have attracted enthusiastic reviews like "Spectacular, one of the best games I've seen"... POPULAR COMPUTING WEEKLY and "Excellent, dangerously addictive, could change the Spectrum games scene overnight"... SINCLAIR USER.

COMING SOON RETURN OF THE THINGS



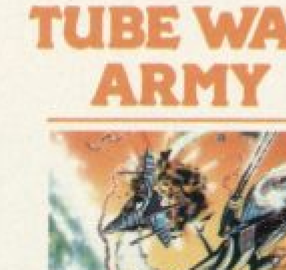
HALLS OF THE THINGS
Written by: Neil Mottershead, Simon Brattel and Martin Horsley



INVASION OF THE BODY SNATCHAS
Written by: Simon Brattel and Neil Mottershead



Written by: Graham Stafford



ROMMELS REVENGE
Written by: Martin Horsley



THE DUNGEON MASTER
Written by: Graham Stafford

All titles for 48K Spectrum unless otherwise stated

PROGRAMMERS! WRITTEN ANY SOFTWARE THAT COMES UP TO OUR STANDARDS? IF SO SEND IT TO US FOR EVALUATION. WE OFFER GENEROUS ROYALTIES.

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I enclose cheque/p.o. for ....
P & P included. Overseas orders, please add £1.50 per item.

SU/7

Delays in replacing faulty Spectrums

I THOUGHT you might be interested in a fault in the Christmas batch of 16/48K Spectrums. I bought mine two weeks before Christmas and a month and a half later it stopped working. I returned it to John Lewis in Oxford Street, London to be told that a part in many computers distributed at Christmas had been faulty. I was also told that it would take two months for the faulty part to be replaced. John Lewis then offered me a full refund.

Anybody who bought a Spectrum at Christmas which starts to malfunction, should take it back and demand that something be done about it.

M Coysten,
London, SE23.

AS A REGULAR reader of *Sinclair User* I am sorry to say I have joined that ever-growing queue outside Sinclair Ltd. Not the queue for the QL. Not the queue for the Microdrive, but the queue for the return of our Spectrums sent for repair under guarantee.

When I visited my local Spectrum dealer I was greeted with the news that he did not have one but had sent mine for repair. The big question was when would it be returned? The answer was "I have no idea — it is usually about four weeks if you are lucky."

My message to Sinclair is look after the friends you have in the big wide world or they will start looking elsewhere, and nobody wants to do that, especially when you have a splendid machine.

Alan Jones,
Potters Bar,
Herts.

The immortal Jet Set Willy

I RECENTLY bought Jet Set Willy produced by Software Projects. It is an excellent game and I have found a way of poking in a code so that it is possible to have infinite lives. It has proved very useful and has enabled me to discover all the rooms and find the items without making the game boring. To obtain it you have to type in before loading:

35 POKE 35899,0 (return)
MERGE " " (return)
Load until 'OK' statement
Stop tape
RUN
Start tape

When the game has loaded you will find that when you are killed you will lose no lives. A word of warning — never fall into a room. If you do and find that you die continuously, press Caps Shift and Break and you will have to start all over again.

I have to mention my views on *Sinclair User*. It is very good apart from the machine code items which are made very complicated and meaningless. I have only once read a helpful machine code item which was in the February, 1984 edition, called Sound Effects, which was set out thus:

Dec. code	Assembler	Comment
6 200	LDB, 200	Load B with no. of times the loop is repeated

All other items I have seen have needed an assembler, which I do not have, and offer non-explicit information about the number of errors only an expert would understand. Then the whole routine is put in a program so that it is impossible to work out which does what.

I am a beginner, so in future editions could you please include the dec. code with the Z-80 assembler to explain what is happening more clearly?

David Gibson,
aged 15,
Exmouth, Devon.

Advertising sexist games

I WAS DISGUSTED by an advertisement in the May edition of *Sinclair User* — disgusted that CCS Software can have the nerve to make separate software for girls and boys. It is bad enough to have the boys' games about war and gangsters, such as Battle 1917, Pacific War, War 70, Gangsters and Plunder — even worse to have girls' games about Show Jumping and Diamonds.

Jamie Wynn, aged 11,
London NW6.

Thanks for the service

MAY I thank Mr Tobin of Melmark Micro Systems for the excellent and prompt repair to my user-damaged, issue one Spectrum?

After destroying my ULA control chip by adding some extra volts to my keyboard cable, I was on the verge of buying a new Spectrum when I saw the advertisement in the February issue, offering an inclusive repair service for £15.50, and decided to send it to the company. To my disbelief it was returned, working, in only 10 working days.

On re-connecting my home-built keyboard I was dismayed to find that the computer crashed whenever certain keys were pressed together. In my haste I assumed that to be due to the fact that the familiar Cockroach modification was no longer there.

In my despair I telephoned the company. It was explained that with the new ULA the modification was no longer required and that some other mistake must have been made in the repair.

To my embarrassment, when I re-checked my cable connections, I discovered that I had let a tiny sliver of solder bridge two adjacent circuit tracks, thus causing the fault.

Far from being annoyed with me for wasting his time, Mr Tobin explained some more of the Spectrum circuit mysteries to me. Many thanks to him and his company for such good service.

Mark Painter,
Bridgwater, Somerset.

Program Printout

I AM WRITING because I am confused. In nearly all the programs you print for the Spectrum certain parts have pieces underlined. I would be very pleased if you could tell me how you do this.

Every time I have tried to type in your programs they have not worked because I have not been able to get the lines under the parts of the program where they are needed.

Mark Johnson,
Kidsgrove, Stoke-on-Trent.

● *Attention, all Sinclair users. We receive many letters from frustrated readers who are unable to type in the program listings published in* Sinclair User *and many assume that the listings are incorrect or incomplete. Those parts of a program which are underlined are to be entered in graphics mode. That and other conventions used to denote graphics characters are explained in detail, every month, on the first page of Program Printout.*

It is essential to read those instructions before attempting to type in a program.

more letters on page 20

Problems with Microdrives

LAST NOVEMBER I received two Microdrives for the Spectrum and, to date, have used them on a daily basis. At first I experienced no trouble and found them very useful. I decided to rearrange my computer room and experienced a series of strange results — every possible combination of crash, loading, saving and running problems.

The computer and drives are all contained in a sponge-filled case. I discovered that the entire set-up was heavily charged with static. If I continually wiped all items with a damp cloth or a zero stat gun I cleared all my problems temporarily.

I discovered the root cause; the TV was moved too close and the static from the television was spilling over and upsetting the drives. A cure was to move the TV 2ft. away. So it appears that the Microdrives do not operate in a static field. That may be the cause of some of the problems other people have experienced with Microdrives.

B G Cornhill,
Aylesbury, Bucks.

● *Many other readers have written offering the same advice.*

Leaving the QL queue

SADLY, Sinclair will lose four of its outstanding orders for the QL. How many others have been forced to the same decision, I wonder, and why four orders?

My original application for a QL was seven days after the news of its launch. In seeking to obtain the computer within the time stated originally I now hold four orders confirmed by Sinclair. Not knowing anybody else locally who has ordered the machine, I trust that it is not company policy to increase demand for the machine.

Now with growing doubts about the machine and the justification for my order being cost-effective, I have had to cancel all four orders.

A H Darge,
Hornsea, Yorks.

Bug in Space Station

I BOUGHT Space Station Zebra by Beyond and while playing it I found a major bug in the program. If you line-up your laser sights anywhere on the far right-hand side and fire, you will destroy the incoming invader, no matter where he is on the screen.

After you have done that about 20 times you win.

K P Cox,
London SE12.

Gilbert factor inconsistent

AS I often refer to the Gilbert Factor as a guide to purchase for games, I was puzzled when checking the Software Directory Cassette Round-up in the May edition of *Sinclair User*. I noticed that Adventure No. 1 by Abersoft was given six points and Colossal Caves by CP eight points. I cannot understand the points system as they are both the same game.

J M Cheal,
Reigate, Surrey.

● *The Colossal Cavern type of adventure has been around for some time, since its conception on a mainframe computer. Since then several companies have produced versions for the Spectrum and ZX-81, including CP, Abersoft — now sold by Melbourne House — Level Nine and Syrtis, to name a few. All the versions are slightly different. Melbourne House changed the Abersoft adventure when it took over the program.*

The Gilbert Factor takes plot into account but also layout and presentation. When reviewed the CP Colossal Caves was considered a better version than that from Abersoft.

Game rating set too high

I RECENTLY bought Hunter Killer from Protek for the 48K Spectrum. It has no right to have a Gilbert Factor of nine. It is very slow, boring and too easy to play. You are the commander of an 'S' type submarine trying to sink an enemy sub. You are on one side of the sea, the enemy near the shore on the far side.

It is very slow; once it took me half an hour before I saw the enemy and then another five minutes before it was in range — at top speed. You cannot do anything while you are trying to get to him.

It says it has 18 control functions. In that half-hour I could use four, going fast or slow, or raising and lowering the periscope. The animated sea view is a line bobbing up and down. The 3D target looks like a flat bucket moving towards you.

Visible torpedo tracks are a few dots going towards the enemy submarine — not even getting halfway there before the sub blows up. The only good thing about it is the control room and chart room graphics but it is useless having good graphics if the game is rubbish.

Paul Tomes,
aged 13,
Wisbech, Cambs.

● *Hunter Killer is a program which makes use of all the Spectrum facilities. The graphics are superb and the real-time action, admittedly a little slow, stands apart from any other program. No doubt better programs will be developed but until then it is one of the best in its class.*

Adventures in Italy

I AM an Italian reader of your splendid magazine *Sinclair User*. I have a 48K Spectrum and I would like to correspond with some English readers to compare notes and experiences.

I am very interested in adventure games, especially Circus, Ten Little Indians, Perseus and Andromeda. Can anybody give me a little help in solving those games?

Enrico Angelini,
Via Garibaldi, 9,
20010 Buscate (MI), Italy.

Wanted: information on the software scene

HAVE YOU any more information on the Software Farm high-resolution games for the ZX-81. What other titles are to follow and when?

Philip Taylor,
Rowlands Castle, Hants.

● *Software Farm plans to release a new series of high-resolution games for the ZX-81 in a few months. Although they are in an advanced state of preparation, the company will not disclose anything about them.*

Computer Rentals Ltd of 142 Whitechapel Road, London E1, produces a high-resolution toolkit for the 16K ZX-81.

I AM anxious to obtain the following tapes for the 48K Spectrum — Grand National, Tennis, Basketball, Boxing.

A J Burrington,
Bedminster, Bristol.

● *The only titles on the market we could find are Tennis and Grand National. Tennis can be obtained from Winters, 24 Swannington Close, Cantley, Doncaster. South Yorkshire DN4 6UA. Grand National is available from Computer Rentals Ltd, from W H Smith, or from 9 Kings Yard, Carpenters Road, London E15 2HD.*



A fine day for tennis on your Spectrum

This is Wimbledon.

The home of British tennis, enjoying Britain's fine weather.

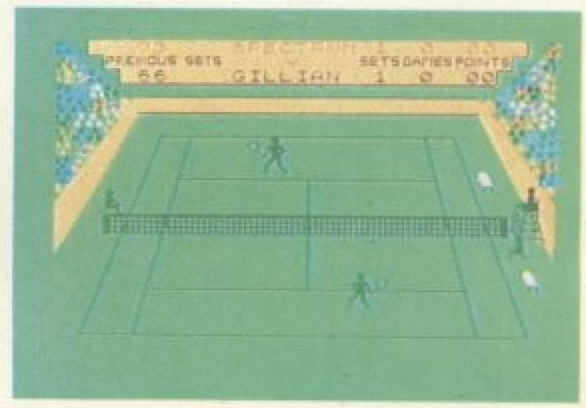
But this summer, things will be different. If rain stops play on court, you'll be able to carry on playing – with Sinclair's 'Match Point'.

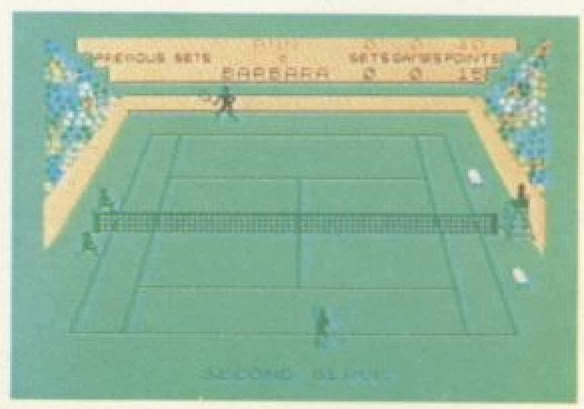
'Match Point' is one of six new, all-action programs for your Spectrum. It lets you play tennis against the computer, a friend, or just sit back and watch an exhibition match.

Enjoy all the features of tennis – backhand and forehand shots, lobs, drop-shots, volleys, a scoreboard... even ball boys are on-call.

But good tennis strokes aren't everything. To win the Match Point Open Championship you'll need skill *and* tactics.

Luckily, though, you won't have to rely on the weather!





'Match Point' has been developed by Psion, one of the UK's top software houses.

You'll find it alongside Sinclair's other new titles – Stop the Express, Bubble Buster, Zipper Flipper, Eric and the Floaters and Driller Tanks – in the shops, today.

At £7.95, it's a real winner!

Selected Sinclair software lines are available from W.H. Smith computer stores, larger branches of Boots, John Menzies, Greens and most other software stockists nationwide.

Sinclair Research Ltd, Camberley (0276) 685311.

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SPECT

BOOKS BY MELBO



Spectrum Machine Language for the Absolute Beginner
A "no jargon" introduction to Machine Language for Spectrum users keen to progress beyond the limitations of BASIC.

"One of the best I have seen on the subject — for once the title is on the nose."
Popular Computing Weekly

"Very readable and excellent value for the beginner."
Sinclair Users' Annual

"An excellent book for anyone wanting to start programming in an alternative to Basic."
What Micro. **£5.95**

The Complete Spectrum ROM Disassembly For the serious programmer who wants to get right to the heart of the Spectrum: its 16K ROM control program. "A useful and interesting book."
Personal Computing News

"The detail is ingenious — amazingly so."
Educational Computing

"A great relief to Machine Code programmers who want to get to grips with the Z80A processor." Sinclair User **£9.95**

Spectrum Hardware Manual
An in depth explanation for the hobbyist who wants to know how the Spectrum works.

"At last a book to explain exactly what is inside the Spectrum . . . plenty of illustrations and detailed explanations." Educational Computing

"The text is well illustrated, thorough and thoughtful . . . a wealth of ideas for projects."
Educational Equipment

"The second most useful book you can buy for your Spectrum — the first being the programming manual that comes with your machine. Very useful stuff indeed." Personal Computer News **£5.95**

Spectrum Microdrive Book
In this book Dr. Ian Logan gives a detailed explanation of the Spectrum Microdrive — the revolutionary high speed memory storage system.

How it works, its capabilities from Basic and Machine Language and the networking and RS232 possibilities are all thoroughly detailed.

A special section deals with the amazing capabilities of the interface including how to add more commands to BASIC!

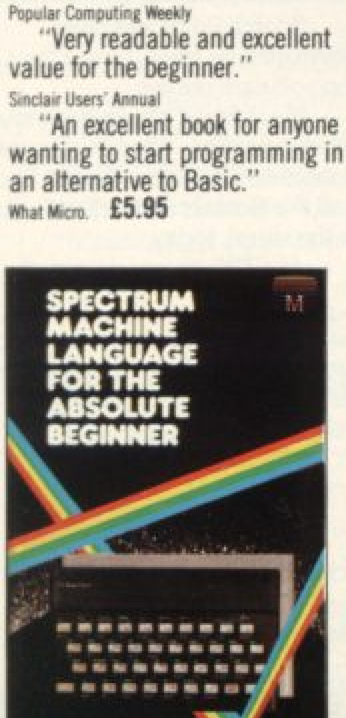
Anyone who wants to expand the capabilities of the Spectrum beyond its present limits must read this book.

"The definitive work."
Sinclair User **£5.95**

NEW

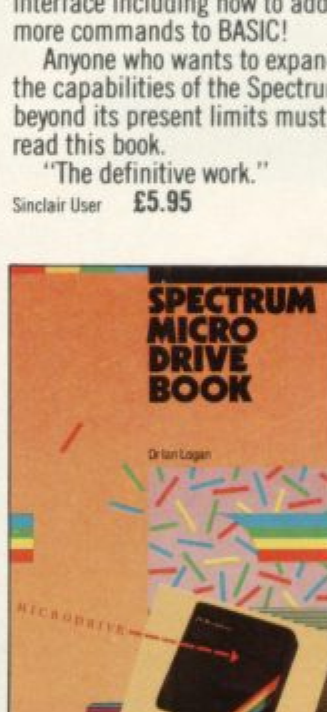
Advanced Spectrum FORTH
With the growing popularity of language, other then BASIC and FORTH in particular, there is real need for information on how to use these languages.

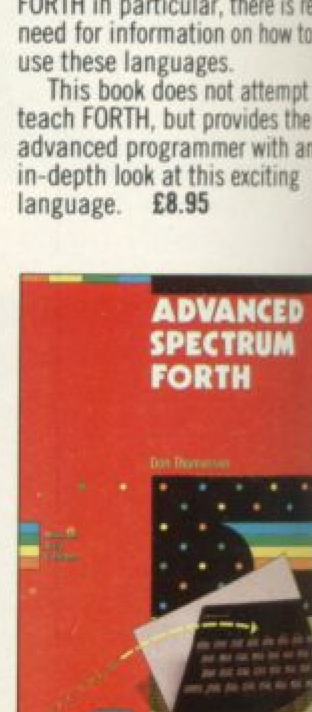
This book does not attempt to teach FORTH, but provides the advanced programmer with an in-depth look at this exciting language. **£8.95**



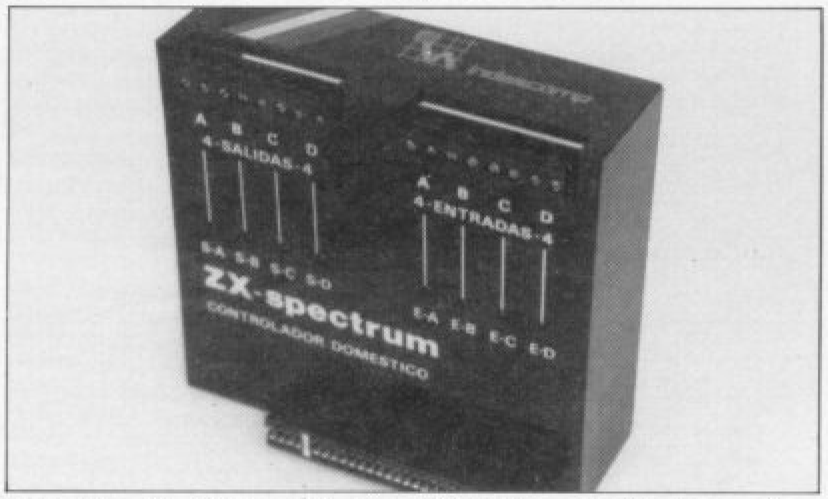








Spectrum switches on for domestic duties



ONE OF the more unusual offerings from the Spectrum chain of shops is the Domestic Controller by Indescomp for the Spectrum. It is an I/O port with four relays built in and four input channels.

The relays can control low-powered equipment such as battery-powered devices or, for example, with the inputs as part of a burglar alarm circuit, the input detecting windows and doors being open and the output opening doors and turning lights on and off. Equally, users who are building a robot, with all its associated in/out requirements, will find it useful.

Each relay can switch up to one amp. No details of voltages are given and the input can detect a voltage of between 4.5V and 50V. Connections to the unit are by screw terminals and a LED is used to show which channels are in use.

To control the unit address 61441 is used, the lower four bits controlling the output and the upper four the input. With Issue 3 Spectrums, due to the changes, the input may vary by seven, i.e., the lower four bits, but a program is included to allow for that.

Other than that the unit is very easy to use, especially if you have a knowledge of binary. Its only disadvantage is that the relays are not marked as being suitable for mains use, which limits its applications.

The Domestic Controller costs £49.95 and is available at Spectrum shops.

Four ways to plug in power

THE MASTERPLUG, as marketed by H & K Electrical, may prove a help to computer users who have to fight for the available mains sockets. It is a small, four-way, mains distribution board, with plugs with which you can connect your computer, TV, printer and, perhaps, disc drive to one mains outlet. As supplied it has a 1.5 metre lead and 13amp mains plug fitted.

Each of the small plugs can handle up to six amps and Masterplug can handle 13 amps in all. The plugs are a non-standard size and, as such, may prove difficult, if you often want to plug your computer into different sockets. The plugs are not fused individually but that should cause no difficulty — it is more a matter of personal taste. It is rated to BS5733 for wiring accessories.

Costing £8.99 inc., it is one of the cheapest distribution boards available. H & K is at 322, Buildford Road, Bisley, Surrey.



Comprehensive kit for cleaner computer care

BIB, better known for its range of hi-fi care kits, has turned its attention to the computer market. A number of new kits are available, top of the range being the Computer Care Kit. It includes Kleen Screen, an anti-static spray and lint-free cloth for cleaning VDU and TV screens; a tape head or floppy disc cleaner with fluid; and Dust Away, a compressed air container for blasting dust from your computer. The tape version costs £8.74 and the disc £9.98.

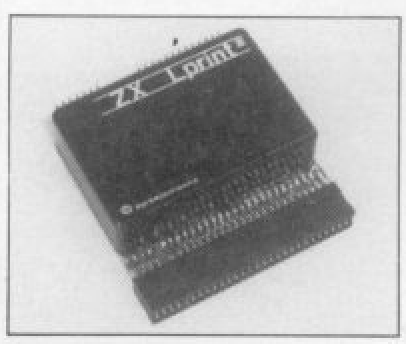
The Kleen Screen is available separately at £2.99 with two cloths and the disc cleaner at £4.99 or £9.98 for an upgraded version which allows you to clean the head 15 times.

Bib products are available from a number of outlets, including W H Smith and other department stores.

Interface to perfect print

THE ZXL PRINT III, from Euroelectronics is one of the most comprehensive printer interfaces available for the Spectrum. With a choice of both Centronics and RS232 in the one interface it will satisfy most users.

The interface has an on-board EPROM which means that you do not have to worry about loading any driving software. Once it has been initialised with the command LPRINT it will output text to any printer. It can then be further configured TO COPY to one of six different printers. There is also the facility to load your own driving software from tape.



With a basic price of £34.95, plus £9.95 for each cable, Centronics or RS232, all inclusive, the interface is one of the cheapest EPROM models on the market. Euroelectronics is at 26, Clarence Square, Cheltenham, Glos.

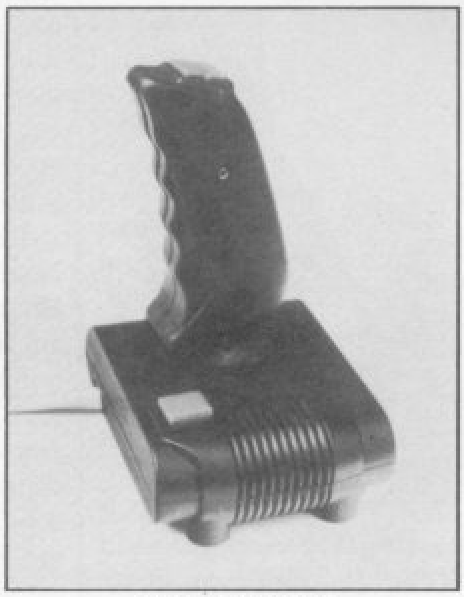
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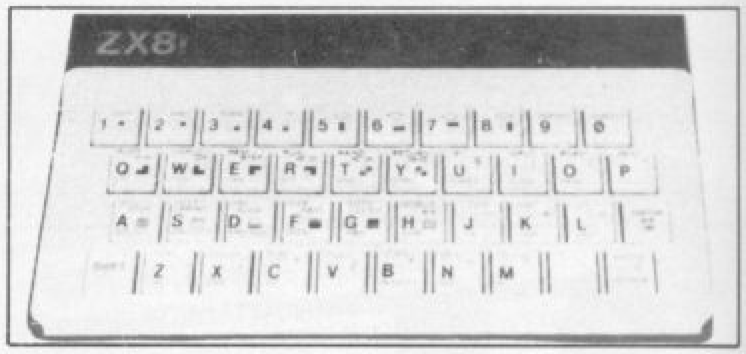
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LS series JOYSTICK	**£9.95**
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Total	**£**

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ZIGZAG (Currah speech synthesizer adds talk!). One of the most involving 3D maze games we've ever played. The Currah speech synthesizer really does help to guide you around the maze ("Look out behind you!") and makes the journey a lot more fun. Progressive difficulty through six levels. Great use of colour, graphics and speech make this one of the most interesting new Spectrum games. STIX: KEMPSTON/ INTERFACE 2/DK'TRONICS. **(DK'tronics) £5.95**

ORC ATTACK *"The animated detail is amazing ... quite original, very playable, very addictive. FANTASTIC. 91%"* (Crash). There are 4 screens as you defend your castle from the Orcs and the demon trolls and the stone warts and the sorcerer! Defend yourself with rocks and your sword and even boiling oil as you dodge their crossbow bolts. Hall of Fame. For 1 or 2 players. STIX: KEMPSTON/ AGF/INTERFACE 2 **(Creative Sparks) 48K £6.95**

MOON ALERT (Currah Speech Synthesizer adds talk!). This game does for cars what WHEELIE did for motorbikes! Can you make it back to lunar base from the wreck of your Space Fighter? You are in your space rover - with real suspension, revolving wheels and a revolving radar aerial. All you have to do is drive back to base, jumping over the obstacles and/or blasting them out of your way! Over 300 screens to travel. Hall of Fame. 1 or 2 players. STIX: KEMPSTON/ PROTEK/SINCLAIR. **(Ocean) 48K £5.90**

PSYTRON *"Will be a very strong contender for game of the year"* (PersCompNews). MUST BE THE FIRST SHOOT 'EM GAME WITH A 20 PAGE MANUAL! 6 levels, each must be mastered before the next is attempted. Amazing multi-animated graphics with different parts of the screen running different animation! Progressive difficulty. WIN A SPECTRUM QL if you have the best score by the end of November. STIX: MOST **(Beyond) 48K £7.95**

DUNGEON BUILDER This amazing program contains 15K of pure machine-code to teach you to **WRITE YOUR OWN GRAPHIC ADVENTURES!** It was two and a half years in the making, but now you can easily learn to write - and illustrate - machine-code adventures. 100-page manual helps. NO STIX. **48K (Dream) £9.95**

FIGHTER PILOT *"A superb simulation ... as a piece of programming it's impressive, as a game it's not to be missed."* (CompChoice). *" THE FLYING IS THE BEST I'VE COME ACROSS."* (PCGames). 3D cockpit view, 3D air-to-air combat, stunning instrumentation. 7 Options include landing practice, flight training, combat practice, actual combat. 4 skill levels. KEMPSTON, INTERFACE 2, AGF STIX. **48K (Digital) £7.95**

THE TRAIN GAME *"An excellent game ... original, well thought-out and full of action: absorbing and amusing"*. (S. User). Run your own railway! Change the points to avoid crashes: watch out for irate hijacking passengers. 30 command keys: 2 track layouts: 7 skill levels, 14 sub-levels. Demo and Pause while you strike! NO STIX **16/48K (Microsphere) £5.95**

SCUBA DIVE *"FABULOUS UNDERWATER WORLD ... if you fancy settling back for a long nail-biting adventure, SCUBA DIVE is very special."* (S. User). Dive overboard and seek your fortune; the way the fish move is incredible! Beautiful full-screen animated graphics: but you'll need strategy as well as tactics to get past all the octopuses! ALL STIX. **48K (Durell) £5.95**

WHEELIE *"EXCEPTIONALLY GOOD GRAPHICS ... smooth, very detailed, with loads of animation."* (Crash). *"The crash sequence is a little too graphic."* (S. User). Jump buses and cars on your SuperDream bike: avoid hedgehogs, but find the ghost rider. Will you beat him? Demo mode. Great sound, too. ALL STIX. **48K ONLY (Microsphere) £5.95**

TRASHMAN *"Technically, the game is superb with smooth scrolling and movement ... wonderful."* (PopCompWkly). The most playable game ever from Malcolm Evans. For 1 or 2 players. Collect the bins - and the tips - avoid the grass - and the dogs! Superb animated graphics. KEMPSTON/PROTEK/ INTERFACE 2. STIX. **48K (New Generation) £5.95**

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BLUE THUNDER *"SUPERB GRAPHICS and smooth pixel-scrolling through six screens ... hugely exciting and very frustrating."* (Crash). Take off from a destroyer, fly your helicopter to a remote island. You will only rescue your comrades if you discover how to destroy the nuclear reactor! 5 skill levels. KEMPSTON STIX. **48K (Wilcox) £5.95**

GO TO JAIL *"EXCELLENT GRAPHICS are used to make a very impressive display indeed ... highly recommended."* (ZXComp). The best computer version of the famous game. From 2 to 5 players, including the Spectrum if you wish. It's ruthless, but honest. Every original feature faithfully reproduced; helpfully scrolling screen display. NO STIX. **48K (Automata) £6.00**

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THE DECISION to buy a printer to complete your computer system will be one of the most difficult and certainly one of the most expensive which you as a Sinclair user will have to make. The variety of printers available tends to confuse rather than facilitate your choice and many of them are likely to cost more than the rest of your system.

Yet if you are intending to use a Sinclair machine for something other than games playing, you will, sooner or later, need to make a permanent copy on paper. With that in mind *Sinclair User* looks at 11 printers, from the inexpensive to those suitable for small businesses.

getting into PRINT

THE FIRST consideration must be the purpose for which you intend to use a printer. All the printers reviewed will produce listings of programs, some faster than others and some more legibly. If you intend to do some word processing the type-style and method of printing is also important.

Most of the machines reviewed are dot matrix printers. That means that, just as characters on the screen are composed of a number of dots — pixels — the printer has a number of little pins which are pushed on to the paper, through the ribbon, to form the character. The greater the number of dots the better the definition of the character.

Just as user-defined graphics are made by changing the arrangement of the dots, dot matrix printers can easily change the type-style or the character. The printer holds those definitions in ROM and by telling it which set you want to use it can print in different type-styles and use different national characters, in some cases even Japanese.

Some of the printers use different methods. The Alphacom 32 and the Brother EP44 are thermal printers. That means they use special, more expensive paper although they are still dot matrix types. The pins become hot and cause the paper to change colour. The Brother can also use plain paper with the addition of a special ribbon.

The Dyneer DW16 is a daisywheel printer, using a wheel which has each character, like those on a typewriter, at the end of a spoke. To change type-styles the wheel has to be changed.

The Olivetti JP101 has a small cartridge which fires an ink-jet at the paper. As there are few mechanical parts the printer is quieter than most.

The Tandy CGP-115 has four ball-point pens which form characters by moving the pen horizontally and the paper up and down.

The speed of a printer normally is measured in characters per second; in theory the higher the number the greater the speed. To test that we used a standard body of text, the first chapter of Genesis, and timed how long it needed to print. The text was prepared using Tasword 2 and printed via a Kempston E interface, where suitable, a total of 796 words over 77 lines.

The results were surprising. The Microline 80, with a quoted speed of 80 cps, took nearly twice as long as the Mannesmann Tally MT80 and three times as long as the Olivetti. The answer would be to take such quoted figures only as a very rough guide.

Another thing to consider is how you want to drive the printer. Two of the machines reviewed connect directly to a Sinclair computer, the Alphacom 32 and the Seikosha. While that is undoubtedly the cheapest method, when and if you upgrade your computer you are left with a printer you may not be able to connect to your new machine.

There are two standards by which printers normally are driven, Centronics and RS232. Roughly speaking, Centronics interfaces have eight wires so that the bits of each byte travel to the printer at the same time along each wire. Serial interfaces have one wire and the bits travel along it one after the other.

Whether you use Centronics or RS232 does not make much difference so long as you do not try to mix them. On many of the printers Centronics is fitted as standard and RS232 is available as an add-on at extra cost.

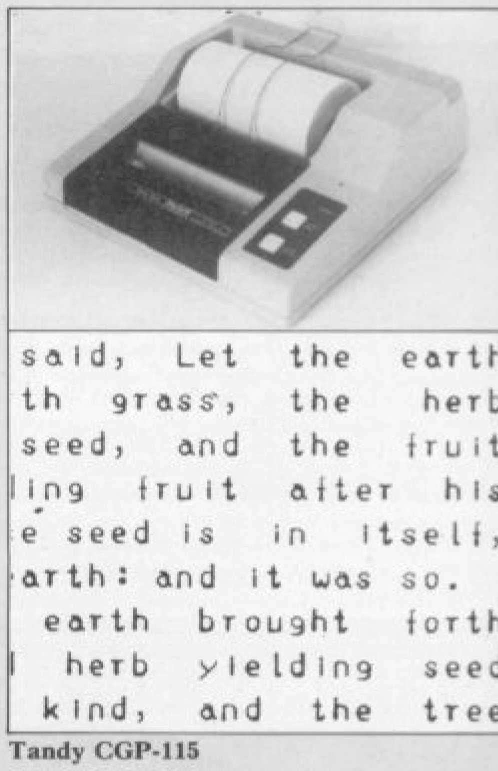
Your future plans must be taken into consideration. Users with a Microdrive



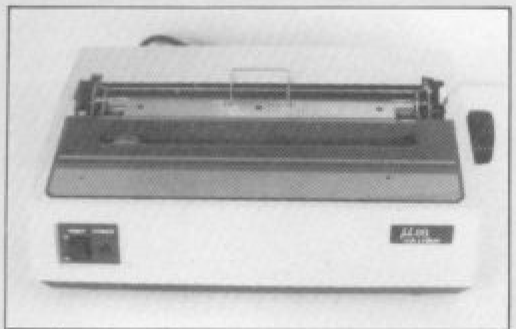
Alphacom 32



Seikosha GP50S

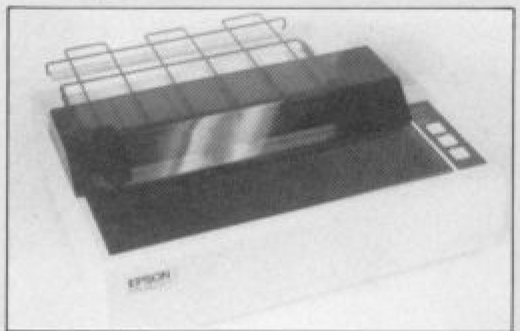


Tandy CGP-115



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Microline M80



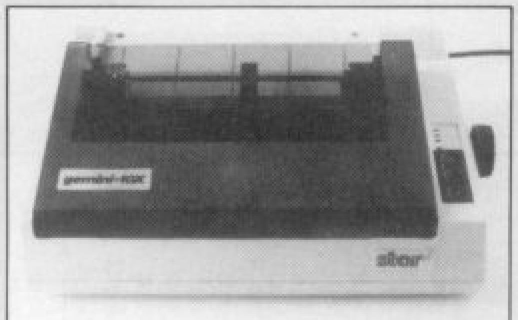
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Epson RX80



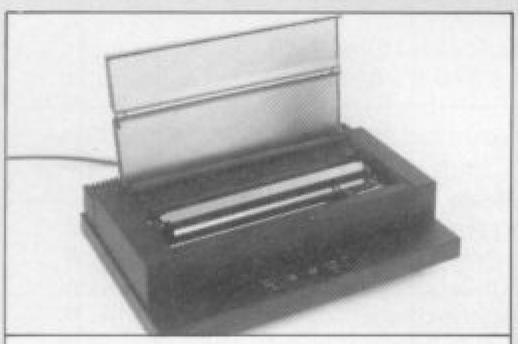
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Brother EP44



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Olivetti JP101



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Mannesmann Tally MT80

can use the RS232 port fitted. If you are thinking of buying a QL it also has an RS232 port fitted as standard. Other add-ons such as modems also tend to use RS232 and so the system has advantages, despite the extra cost.

The width of paper the printer can handle may also be a consideration. Normal listings may use only 32 columns but if you like to add REM statements at the side or for word processing, 80 is the minimum.

It is often necessary to indicate to the printer what you want it to do, whether changing the type-style or feeding paper through it. There is a standard for it known as ESCape codes, i.e., codes which escape from normal printing to do something different. Those codes were originated by Epson and are now used by most other makes of printer.

To help you each printer is now considered, briefly, in turn. The Sinclair printer has not been included as it has been discontinued and will be available only while stocks last.

Alphacom 32 is the cheapest on the market at the moment. It has reasonable print quality and is easy to use. It has only a ZX-81 size connector, so Spectrum users must use it as the last add-on. From Dean Electronics or Prism.

Seikosha GP50S is an inexpensive plain-paper printer, not particularly fast and rather noisy but easy to use. It has a Spectrum-size edge connector, so ZX-81 users will need an extender card not yet available from Seikosha, so try Eprom Services. From DRG or Prism.

Tandy CGP-115 is the cheapest colour printer; it is very slow but can do pleasant graphics with the appropriate software. From retail shops.

Microline 80 is supplied with roll paper holder as standard. It uses ordinary typewriter ribbons. It has only one type-style. From X-Data.

Brother EP44 is a portable typewriter with RS232 connection. It is not really suitable as a computer printer but as a typewriter it is amazing. From local typewriter shops.

Olivetti JP101 is a quiet ink-jet printer; it has slightly blurred print but is reasonably fast.

Epson RX80 is the standard by which other printers are measured. It is versatile with clear print and all the facilities you are liable to need.

Star Gemini-10X was caught by a recent price reduction for the Epson, which it mirrors. It may be discounted further. From London Computer Centre or Micro Peripherals.

continued on page 32

continued from page 31

Mannesmann Tally MT80 is a good-looking printer, also heavily discounted.

Canon PW1080A is very fast and has a good range of facilities, including programmable characters. It is slower in near letter-quality mode. From London Computer Centre or Micro Peripherals.

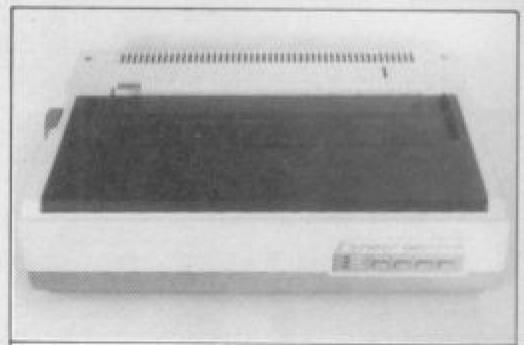
Dyneer DW16 is a business users' daisywheel printer. The code is compatable with Diablo printers. From X-Data.

British Olivetti Ltd, 86-88 Upper Richmond Road, London SW15 2UR.
Dean Electronics Ltd, Glendale Park, Fernbank Road, Ascot, Berkshire SL5 8JB.
DRG Business Systems Ltd, Peripheral Division, 29 Lynx Crescent, Winterstoke Road, Weston-super-Mare, Avon BS24 9DN.
London Computer Centre, Grafton Way, London N1.
Mannesmann Tally Ltd, Molly Millar Lane, Wokingham, Berkshire RG11 2QT.
Micro Peripherals Ltd, Basing, Basingstoke, Hampshire RG24 0BY.
Prism Microproducts Ltd, 18-29 Mora Street, City Road, London EC1.
X-Data Ltd, 750-751 Deal Avenue, Slough Trading Estate, Slough, Berkshire SL1 4SH.



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Canon PW1080A



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Dyneer DW16

	Rec. retail price	Ports			Plain/thermal	Printing method	Characters per line	Dots per character	Characters per sec.	Time for test (secs.)	Max. paper width (inches)	Line feed button	Escape codes	Different type-styles	Graphics
		Centronics	RS232	Sinclair											
Alphacom 32	70			✓	T	Dot	32	8×8	—	50	4¼	✓			✓
Seikosha GP50S	138			✓	P	Dot	32	7×7	40	152	5				✓
Tandy CGP-115	149	✓	✓		P	Pen	40/80	N/A	12	483 1440	4½	✓			✓
Microline µ80	229	✓	£68		P	Dot	80	9×7	80	170	8½				
Brother EP44	253		✓		T/P	Dot	80	24×18	16	383	8½	✓			
Olivetti JP101	265	✓	£40		P	Ink jet	80	7×7	80	67	9	✓	✓		✓
Epson RX80	286		£69		P	Dot	80	9×9	100	80	8½	✓	✓	✓	✓
Star Gemini 10X	286	✓	£80		P	Dot	80	9×9	120	69	—	✓	✓	✓	✓
Mannesmann Tally MT80	299	✓	£57		P	Dot	80	7×8	80	92	—	✓	✓		✓
Canon PW1080A	367	✓	—		P	Dot	80	11×9	160	48	10	✓	✓	✓	✓
Dyneer DW16	—	£378	£413		P	Daisy	101	N/A	14	330	10	✓	✓	✓	

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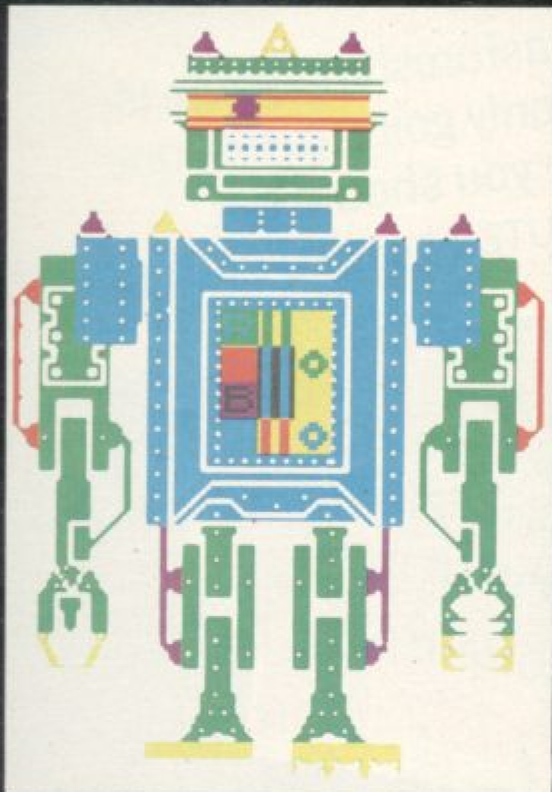
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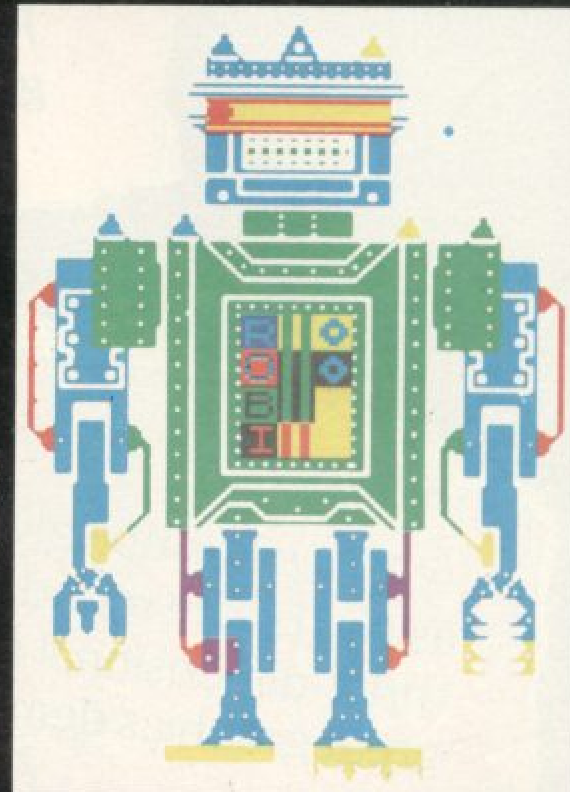
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CHALLENGE RESEARCH



MARCH OF THE ROBOTS

We present the winning entries in our February competition



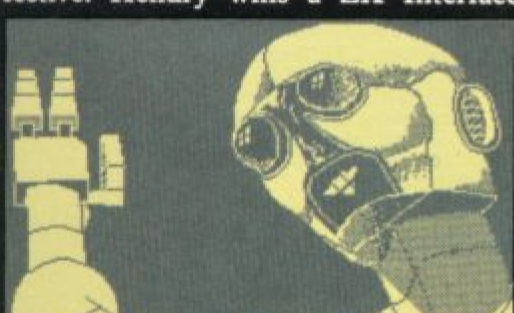
THE ROBOT competition in the February issue of *Sinclair User* generated an invasion of awesome automata from our postbag. Metal men of all shapes and sizes clanked across our TV screens, from coy female teaching robots to bloated, one-eyed bug-blasters.

Fighting the onslaught and deciding the winner was no easy task but eventually we chose the colourful, complex, cloning creation of Paul Dowthwaite of Crowhurst, East Sussex. His robot, called Robi, wins him a Topo robot, worth more than £1,500.





Second place was taken by Mike Hendry of Sheffield whose robot, Nite, stalks along a corridor, eyes swivelling to left and right. Although the design is simple, the animation is extremely effective. Hendry wins a ZX Interface





One with Microdrive and cartridges, together with an Interface Two with Tranz Am and Pssst games ROMs.

The third prizewinner is Tobias Chapman of Ilkley, West Yorkshire. His Zeus robot plays the lead in a short cartoon. It was the fine complexity of the design and the presentation which won Chapman the prize of a Fidelity colour television set.



The standard of the competition was very high, as can be seen from the selection of designs on this page. Twenty-five runners-up will receive five games tapes from leading software companies — Artic Computing, Automata, Cases Computer Simulations, Crystal



Computing and New Generation. The runners-up were:

V Teply, Prague, Czechoslovakia; M Gathercole, Chertsey, Surrey; N Gordon, Bilton, North Humberside; P Damaa, New Malden, Surrey; C Robb, Hebden Bridge, West Yorkshire; A Proctor, Blackburn, Lancashire; P Cheung, London N4; G Styles, Failsworth, Manchester; S Harding, Oakley, Bedfordshire; S McCoombe, Workington, Cumbria; Class Three, Hinchcliffe Primary School; M Bell, Hanwell, London; J Franchi, Hassocks, West Sussex; P Etwaroo, Harrow, Middlesex; Jacob Wittrock, Farum, Denmark; C J Howard, High Wycombe, Buckinghamshire; P Luke, Farnham, Surrey; D Selvage, Darlington, Durham; M Collins, Sheffield S17; T Petrovic, Zagreb, Yugoslavia; N T Morton, Dorchester, Dorset; S E Smith, Solihull, West Midlands; P Jonkman, Zaandam, Netherlands; Jim Hebberts, Halesowen, West Midlands; and S Johnson Hythe, Kent.

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PRACTICAL COMPUTING.

Brilliant!

WHICH MICRO? AND SOFTWARE REVIEW.

...a terrific version of the arcade motor racing game...graphics are superb...sound, too is very good as brakes screech and engines rev-up.

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PERSONAL COMPUTER NEWS.

What can we say?



We're overwhelmed. Though we should just add that with Atarisoft, you can now play Pole Position* on the Commodore 64, BBC and Spectrum computers, as well as on all Atari® systems. Oh, and we're giving away free a Grand Prix kit and full colour wall chart with every game.

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***from* ATARISOFT™**

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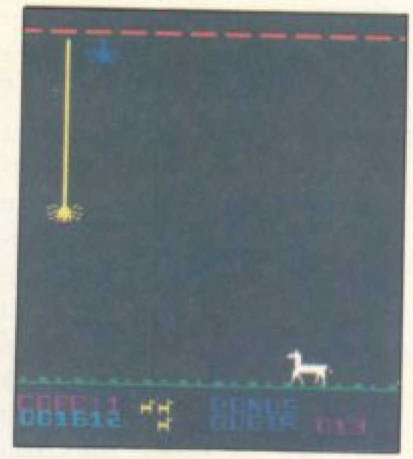
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Unleash your llamas on sinister spider menace



META-GALACTIC Llamas Battle at the Edge of Time, from Salamander Software, is a reasonably simple game with an extremely long and inventive name. Like the name, the game, for the 48K Spectrum, is inventive and its simplicity is deceptive. You will find that as soon as you start playing you are hooked.

The hero is an alien llama which destroys swarms of creatures which look like spiders, as they absail lengths of web ready to kill you if you touch them.

When you fire at the spiders your laser bolts will bounce off a force field at the top of the screen. You can lower the field as the spiders descend so that you can find the correct angle for the shot. If you hit a spider's web-cable the creature will fall and turn into a worm which tracks you along the ground. If it touches you one of your llama lives will be lost. The skill involved in the game is to hit the spiders while they are still in the air.

Once you have passed a level you can proceed to the next which is faster and contains more spiders. If you are feeling really masochistic you could start at a more advanced level.

Meta-Galactic Llamas is a Jeff Minter game and as such was meant originally for the Commodore computers.

For that reason the game is not so good as the original. It is still, however, a very impressive game although the graphics are not stunning and the sound is nothing to rave about. Minter, with the help of programmer Chris Clark, has gone for originality and addiction instead of the things which usually make a good Spectrum game.

META-GALACTIC LLAMAS BATTLE AT THE EDGE OF TIME
Memory: **48K**
Price: **£6.95**
Joystick: **Programmable**
Gilbert Factor: **8**

No fun at the Carnival

THE IDEA of presenting a carnival shooting gallery as a computer game would be interesting and the software would sell in great numbers so long as it was programmed in a moderately competent manner.

Carnival, for the 48K Spectrum, succeeds on the first point but fails miserably on the second. The game involves shooting ducks, owls and rabbits as they move across the shooting rank. You must be wary of the ducks which can swoop and take some of your limited number of bullets.

The bullets can be replaced by shooting a square card which moves with the animals and contains the bonus number of bullets.

The letters b-o-n-u-s also travel round the range and you should shoot them to obtain extra points. If you hit the pipes which spin round at the top of the screen like a windmill you will also get more points.

Points may win prizes but not so far as Carnival is concerned. The graphics are only just presentable and they flicker during animation. The game could have been written as easily in 16K with Basic — it certainly looks as if it has been.

The idea of Carnival is good but more time could have been spent programming it.

If a better version is produced, by all means buy it but we do not recommend Carnival even for children. It can be obtained from Eclipse Software, 4 Oxford Road, London N9 0NA.

CARNIVAL
Memory: **48K**
Price: **£6.45**
Joystick:
Kempston ZX Interface
Gilbert Factor: **5**



If you can't beat them, join them

IT WILL take several months of play to reach your target in **Millionaire** for the 48K Spectrum from Incentive Software. The idea is to start a software house and then either sell your products to other companies for them to market or sell directly to the retail trade. The problem is that the scales of success incorporated into the game are such that it will take a long time to get anywhere near a million pounds or dollars in profit.

During the game you can specialise in a specific type of software and you have to tell the program which qualities you desire most in a product. You will then be informed of your current financial position, depending on how well your software is selling and the amount you have had to pay in bills.

Unfortunately you cannot make large profits quickly because of the low limit to numbers of program copies you can make by duplication. Another difficulty is that the game relies heavily on luck. You may put in one set of figures during one session and then enter them again during the next session and have completely different results.

Despite the minor flaws in the program, Millionaire is one of the few addictive strategy games on the market. You may not become a millionaire or learn how to handle the business of a software house but you should find the experience engrossing.

MILLIONAIRE
Memory: **48K**
Price: **£5.50**
Gilbert Factor: **7**

Feeble four from Sinclair

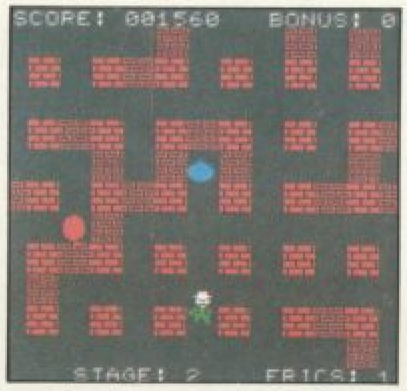
SINCLAIR RESEARCH is continuing its policy of marketing games under licence with four new releases. **Zipper Flipper** by R-E-D Sunshine is a pinball program with a fruit machine feature included. You have to break down a wall of bricks with the ball to bring the fruit machine into play.

The other three games are all by Hudsonsoft. **Driller Tanks,** which sounds like a video nasty, is a simple game of underground warfare, as you use your tank to prevent marauding monsters tunneling to the surface.

Bubble Blaster is a slightly more interesting program in which you must burst bubbles with a ray gun before they land on you.

Those three games all suffer from a very simple concept which has not been developed to provide any real variety during the play. The graphics on Bubble Blaster, though they could be better yet, are of higher quality than in the other two programs but are also the least complex when seen on the screen, even though they may be well-programmed.

The fourth in the series, **Eric and the Floaters,** is clearly superior to the other three. Eric is attempting to explore a lost underground civilisation by planting



bombs in a network of tunnels to clear blockages and reveal treasures.

He is pursued by balloon-like Floaters, which also have to be killed with the bombs. The concept is again simple but in this case there are a number of hidden surprises which increase the enjoyment for the player out of all proportion to the extra trouble taken to program the refinements.

To play the games with a joystick you will have to use Interface Two, or one of the programmable interfaces, as Sinclair is clearly not interested in supporting peripherals manufactured by other companies.

ERIC AND THE FLOATERS
Memory: **48K**
Price: **£5.95**
Joystick: **Interface 2**
Gilbert Factor: **6**

ZIPPER FLIPPER
Memory: **48K**
Price: **£5.95**
Joystick: **Interface 2**
Gilbert Factor: **4**

DRILLER TANKS
Memory: **48K**
Price: **£5.95**
Joystick: **Interface 2**
Gilbert Factor: **3**

BUBBLE BUSTER
Memory: **48K**
Price: **£5.95**
Joystick: **Interface 2**
Gilbert Factor: **5**

Centipede wriggles on

ANYONE who likes fast action unsullied by graphics or any form of storyline will enjoy **Centipoid Plus 3** from Orwin Software. As the name indicates, it is another spin-off of that old favourite Centipede. There are no instructions on the cassette insert but detailed explanations on-screen show which nasties are to be avoided and how many points can be scored by destroying them. There are six stages to the game and scoring 100 points on one stage will lead you to the next. You receive a bonus for completing a stage in good time and a minimum score of 500 points takes you to the high score table.

Although the graphics are simple, to put it mildly, that does not matter too much as you will probably be too busy firing and avoiding enemy bullets to notice. Facilities such as being able to define your own keys, choose the stage at which you want to start, and to adopt an auto-fire facility make this a thoroughly playable if not sophisticated or original game.

CENTIPOID PLUS 3
Memory: **48K**
Price: **£5.95**
Gilbert Factor: **5**

The bells are ringing

ENTHUSIASTS for the popular amusement arcade game **Hunchback** will enjoy the version from Ocean Software. You are Quasimodo, the notorious Hunchback of Notre Dame, who in legend rang the bells of the famous cathedral. In the game you have to rescue your sweetheart Esmerelda, who is imprisoned in a tower on the cathedral battlements. You perform the selfless deed by leaping over fireballs, swinging on ropes and ringing the bells, pursued all the time by a tenacious French soldier.

The game as released is a more or less direct copy of the original arcade game, which makes it simple in design but at the same time a sure winner with those who have unloaded a fortune in 10 pence pieces in dingy halls of pleasure. There are 15 screens but they lack the variety of many arcade games, being based on three or four basic configurations with added hazards at the later stages. On the plus side, the game is challenging but very easy to play and also addictive.

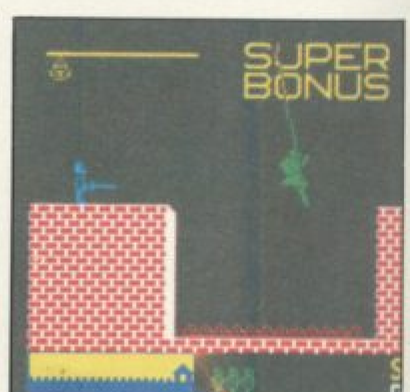
Graphics are competent if not awe-inspiring. Quasimodo is a respectable size, which makes a change from some of the tiny stick-figures which feature in some games. The main difficulty with the graphics is that old Spectrum chestnut of how to prevent the colours spilling over when one colour over-writes another.

In Hunchback, as an example when the green Quasimodo falls to his doom, sections of the red wall also turn green momentarily. That was less of a fault previously than it appears now, with companies like Ultimate and Software Projects producing games which apparently solve the problem.

The action is pacy but not so fast that it discourages the less nimble-fingered among us. Timing rather than sheer speed is the secret of success in Hunchback.

Ocean has produced a game which, although it does not dazzle the eye or numb the brain with its complexity and design, is nevertheless a good, solid version of an arcade classic.

HUNCHBACK
Memory: **48K**
Price: **£6.90**
Joystick: **Kempston, Protek, Sinclair.**
Gilbert Factor: **7**





Spy rings of power

DESPITE its original name, **Psi-Spy** for the 48K Spectrum is an unoriginal arcade adventure game. The object of the quest is first rings of power and then keys which can be found in the Dungeon of Zar. To get them you have to read the instructions several times — and try to move your character round the screens filled with uninspiring square monsters which look as if they have fallen from the Spectrum User Manual.

The approach to the dungeon, where you have to pick up several rings to enter and produce some kind of score, takes the computer almost a minute to set up using its colour-filling algorithms.

The game is an adventure of discovery as you will continue to find new keys to press the further you proceed. To be fair, the plot has some depth as you have to interrogate guardians of the keys using a mind probe and press various keys to decide whether to eat, take or pay for objects.

Psi-Spy would have been original and interesting a year ago but it looks too much like a cross between Black Crystal from Carnell and Manic Miner from Software Projects for comfort. If you want another dungeons game with average graphics, the game is for you. It can be obtained from Postern, PO Box 2, Anderoversford, Cheltenham, Glos GL54 5SW.

PSI-SPY
Memory: **48K**
Price: **£7.95**
Gilbert Factor: **5**

Cheetah lacks speed

IN CONQUEST, from newcomer Cheetahsoft you have to conquer a sizeable portion of Europe and the Mediterranean. You start as emperor at the head of one legion and, beginning from your capital city, you set out to triumph, conquering whatever you pass over. As your territory expands it can support more legions and the empire grows apace.

The game has five levels, the first few serving as introductory modes. In the full game barbarians will attack the fringes of the empire, plague may decimate the land, rival empires rise to challenge you, and your subordinate generals may revolt if they become too powerful, plunging your people into civil war.

The representation of the map is very impressive and the structure of the game has been thoughtfully worked out to provide a real challenge, as well as a sense of genuine participation in great events.

The biggest disadvantage to the game is that it is very slow, as much of the program is written in Basic. While that does not affect your moves too much, as you need to think about them carefully, the other operations, such as the action of the plague or the barbarian attacks, are painfully long-winded.

Cheetahsoft appears to recognise there is a problem, as the program instructions exhort the player to persevere and try the full game before making a judgment. It would be better by far to have written the game in full machine code to avoid the possibility altogether.

None of those faults, however, renders the game unplayable. If you succeed in controlling an empire of 100 squares on the map, your performance will be assessed in comparison with great imperialists of the past.

We recommend **Conquest** to lovers of strategy games with a sympathy for the problems of Attila the Hun or Napoleon but the rating must reflect the fact that many people will be disappointed by the slow response time and fussy graphics.

CONQUEST
Memory: **48K**
Price: **£6.95**
Gilbert Factor: **6**



Arena gets thumbs down

FOR ONCE you do not have to save the world — merely your own unlovely hide, battling hordes of mutants in the stadium of the future.

The game is a matter of killing as many foes as possible while moving round the rectangular arena. When you clear a screen, a new wave of mutants appears. The only mildly original twist is that the arena begins to shrink as the game progresses.

Nor is it the fastest arcade game in existence, particularly if you want to fire continuously.

Arena 3000 may appeal to those who believe that just because you have six legs or a green torso you deserve to be obliterated but there are no obvious miracles of programming to justify Microdeal producing yet another such game.

ARENA 3000
Memory:**48K**
Price: **£5.50**
Joystick: **Kempston, Sinclair, Cursor**
Gilbert Factor: **5**

Watch your garden grow

VEGA-TABLE is a program designed to help amateur gardeners get the most out of their vegetable plot by allowing you to plan the year's crops. There is a set of commands allowing you to define the size of your plot, dividing it into three separate areas for the purposes of crop rotation.

You can then decide when and what to plant in each area and the screen display shows the number of plants suitable for that row and indicates the correct distance apart for planting. The program produces a calendar showing when you should expect to be harvesting the crop and what yield you should achieve — slugs and the weather permitting.

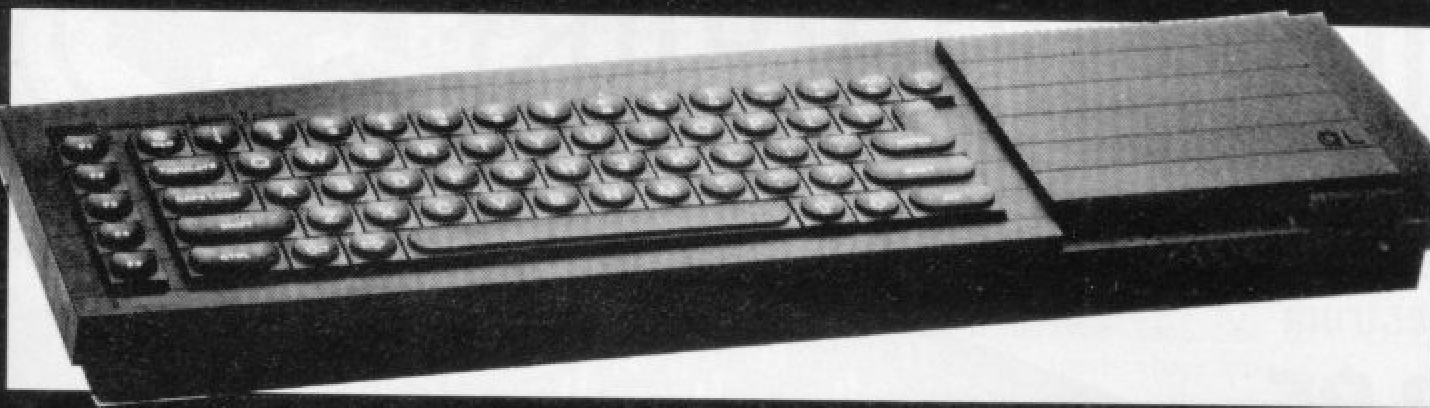
Vega has included a list of the vegetables and details of each one. There are 42 in all and most of the standard varieties are included. The program should appeal most to the armchair gardener who loves to spend hours with seed catalogues planning an assault on the barren earth. It is easy to use and the graphics are reasonably attractive. If only it were as easy to produce the best broccoli in real life.

VEGA-TABLE
Memory:**48K**
Price: **£6.75**
Gilbert Factor: **7**


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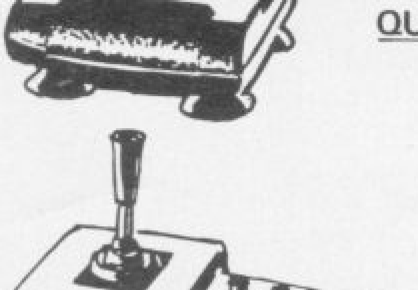
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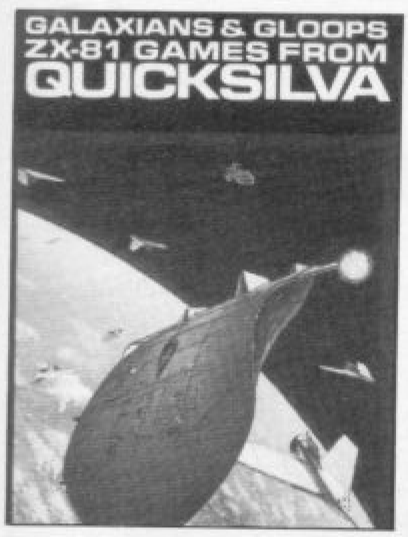
Space and maze madness on the ZX-81

ONE OF the major disadvantages of the ZX-81 is that the graphics, if you can call them that, are very low in resolution, being made up of black blocks which can be PRINTed or POKEd on to the screen.

Computer Rentals Ltd has circumvented the problem by producing a 16K high-resolution package which will give a screen display on a grid of 192 × 256 pixels. It can be POKEd into action from a Basic program.

All the usual Spectrum graphics are available, in black-and-white format, including circles, line and arcs. It is also possible to make your own user-defined graphics of objects such as space invaders, pac-men, or even foreign alphabets.

Although the utility can produce some incredible pictures, there are disadvantages. If you intend to draw complex designs using mathematical formulae which include sine and cosine, you will find that the computer takes about 20 minutes to complete the graphics in FAST mode. You will have to tolerate the grey screen for a considerable time. It does not take quite so long to draw a few lines and circles but it certainly takes longer than its big brother, the Spectrum.



One of the major shortcomings of the package is the pocket-sized manual which attempts to explain all the features of the utility in a short space. The booklet seems to have been written by a programmer, or by a person who has taken for granted that the user will know about the computer and its memory map. Such an assumption is dangerous and leaves new users rushing for books on machine code or, at least, a book on POKEing.

High-Resolution Graphics can be obtained from most branches of John Menzies and W H Smith.

Although Quicksilva is not producing new ZX-81 arcade games, the company still has some top-ranking games in its range. **Galaxians** and **Gloops** are two games on one cassette, one of them an old arcade favourite and the other an old favourite under a new name.

Galaxians involves a flock of alien birds which take turns to swoop down the screen at your laser base and fire death-dealing energy bolts.

The screen display is not so awe-inspiring as other versions of the game. For instance, the birds do not swoop with wings at an angle — they just drop down, like Vs, from their positions in the flock.

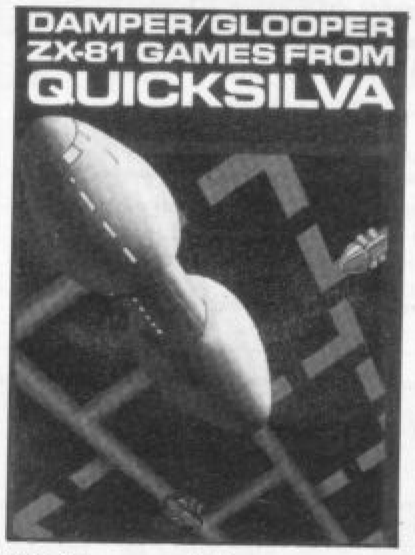
The game is difficult to play, even though you can alter the way in which the aliens attack. It is possible to change the number of Galaxians which swoop at you and also the number of aliens. You can also change the number of salvos which are fired at you.

Even at the lowest settings the game can become irritatingly difficult and addictive. At the highest level only the best arcade player will survive for any length of time.

The other game on the cassette is Gloops. It is difficult to know why Quicksilva decided to use that name but the program is an average version of Pac-man.

The only differences between Gloops and the original Pac-man is that the maze layout can be changed by the player and the speed of the ghosts can also be set. Unfortunately the instructions are vague as to the scale at which the speed is set, so if you type zero the ghosts will react quickly and if you type nine the ghosts will be slow.

Gloops is one of the fastest versions of Pac-man on the ZX-81, even if it is not the best graphically. It can be obtained from Quicksilva or from W H Smith.



Another Quicksilva double-game cassette is **Damper** and **Glooper,** both for the 16K machine.

Damper is a game in which you take the part of a droid who must turn off the power on a grid before the leeches damage the power cables. Your character travels round the power lines and when you have been around the square, that square is filled and the power will be turned off. To reach the next level you must turn off the power in all the squares.

By chasing round the squares you can attack the leeches. If, on the other hand, you are touched by one of them they will electrocute you and a life will be lost.

The game does not need high-resolution graphics to be effective as it uses thick lines on the screen. The special effects when your damper is electrocuted give the game a professional finish.

Glooper is another version of Pac-man which looks like a car, and the ghosts, which look like little racing cars, chase after it.

As usual, the aim is to evade the ghosts and eat the power pills. Glooper is more innovative and attractive as a version of Pac-man than Gloops. It uses the whole screen to display the maze, rather than just a portion in the middle. The two games look sufficiently different from each other to justify a company putting both in its range but the concepts are too close for comfort.

All Quicksilva ZX-81 games are worth buying, although they lack features which would have been helpful. For instance, it might have been a good idea to put in an option to re-define what can be used during play on all the games. If that had been the case the games would have been easier to play, by left- and right-handed people, and also much more user-friendly.

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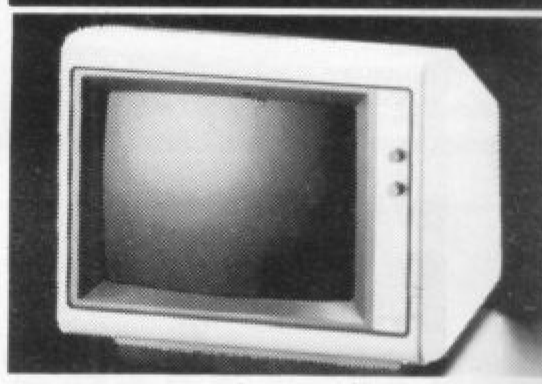
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1984 CAMBRIDGE AWARDS

SINCLAIR USER and Cases Computer Simulations announce the 1984 Cambridge Awards for programming, the annual competition to find top programmers for Sinclair computers.

This year we are offering a first prize of £2,000 plus royalties to the programmer of the most innovative and appealing game for the Spectrum, ZX-81 or, in the unlikely event of anyone receiving one, the QL computer. The award winner will also be presented with the Cambridge Trophy for programming.

In addition to the first prize there are four second prizes of £250 each plus royalties and 25 runners-up prizes of five CCS programs. All prize-winners will receive a free annual subscription to *Sinclair User*.

We are looking for exciting programs which present the player with a challenge in decision-making and tactical play. Games which graphically depict real-life situations, such as piloting an aircraft or driving a motor vehicle, will also be considered, as will games which have a particular appeal for girls. The categories of programs which, therefore, can be submitted include adventure, strategy, simulation and war games.

Entries will be judged for originality and innovation, playability and addictive quality, graphics and the use which is made of the computer. The presentation of the instructions and the program documentation will also be taken into account.

The award will be judged by the same panel of experts who judged the 1983 Cambridge Awards — Mike Johnston, consultant editor of *Sinclair User* and organiser of the highly-successful and long-running ZX Microfairs; Trevor Toms, author of many best-selling Sinclair computer books; and John Gilbert, deputy editor of *Sinclair User*. A representative of Websters Software Ltd will also be on the panel, which will be chaired by Bill Scolding, editor of *Sinclair User*, and Melvin Lloyd-Jones, a director of CCS.

The presentations of the awards will take place on Thursday, October 4, 1984 at the Ritz Hotel, Piccadilly, London W1.

Rules

- Entries must be on cassette accompanied by a listing, detailed explanation of the program and an entry form. The entry form is printed on this page of *Sinclair User*. Entrants must warrant that their programs are original.
- Only programs for the QL, Spectrum or ZX-81 will be considered.
- Entries must reach *Sinclair User* at 196-200 Balls Pond Road, London N1 4AQ not later than Wednesday, August 4.
- The entrant assigns CCS the exclusive licence with the right to sub-license, to copy, modify, sell and publish the original or modified program in any form and CCS undertakes to pay a royalty fee of 20 percent of the nett invoice price on the sale of such program(s) and further will pay a fee of £10 in respect of each publication of the respective program listing. CCS assigns ECC Publications the exclusive world-wide rights to publish the listings of all entries.
- The winning programs shall become the property of CCS, which undertakes to market the programs and to pay the winner a royalty and fees as detailed.
- The organisers retain the right to offer any entries for use by Micronet on an agreed royalty basis.
- Entries will not be returned and no correspondence can be entered into between entrants and organisers. The judges' decision will be final.
- Employees of ECC Publications and CCS and their associated companies are ineligible.

1984 CAMBRIDGE AWARDS ENTRY FORM

Title of game ....

Description of game ....

....

....

Machine: ZX-81/16K Spectrum/48K Spectrum/QL (delete as applicable)

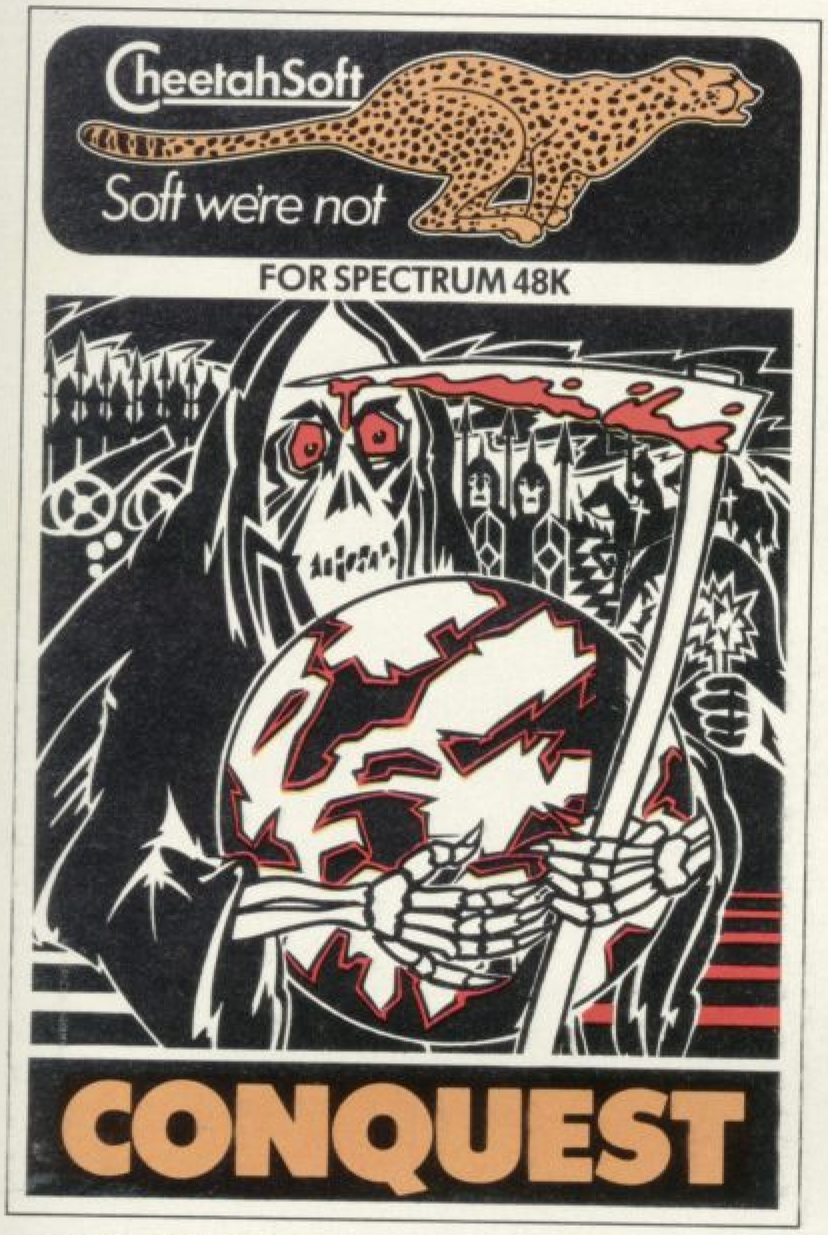
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Christian Urquart won his spurs with **Hunchback.** He rides again in search of new conquests. Chris Bourne tells the tale

Knight moves

ABU DHABI, a small oil-rich state on the Persian Gulf, seems an unlikely place to seek the origins of Quasimodo's frantic attempts to rescue Esmerelda in **Hunchback,** the best-selling game from Ocean Software. Nevertheless, that is where the Urquart family were living in 1980 and where young Christian Urquart, then 14, first became interested in computers, as the international school he attended had an IBM system and Urquart found he enjoyed using it.

The Abu Dhabi experience lasted a year — Urquart says it was like having a party every night — and then the family returned to their home at Wallasey, Merseyside. Urquart bought a ZX-81 and began to write games in Basic as he was disenchanted by the low quality of the games available in the shops.

Meanwhile, on the other side of the Atlantic, David Ward was reaching the end of a six-year stint in Hollywood, involved with coin-operated machines. He returned to England in 1982 and bought his son a ZX-81. Like Urquart, Ward was unimpressed by the quality of commercial ZX-81 software but, unlike Urquart, he was in a position to do something about it.

"The games I saw in the States were so much better. There was obviously a market, if only for games like Defender or Space Invaders," he says.

Ward decided to invest in computer games and set up a small mail order company in the autumn of 1982, which was later to become Ocean Software. He advertised for programs and was pleasantly surprised by the response. One of the programmers who replied was Christian Urquart.

Urquart had written a game for the Spectrum called **Transversion.** "It was a grid game," he says. "You had to go round picking up objects while evading the guardians." Urquart, amazingly, did not own a Spectrum at the time. He wrote the program on a friend's machine while learning Z-80 machine code. He took the game to Ocean on impulse and Ward decided to publish it. Encouraged, Urquart said he was working on another game — was Ward interested?

Ward had other ideas for his new discovery. One of the features of Ocean Software is its commitment to high-quality graphic arcade games, such as **Kong** or **Armageddon.** Ward had bought the publishing rights to Hunchback, which had been a great hit in the amusement arcades, and asked Urquart whether he could write a Spectrum version.

He needed a finished program quickly and Urquart agreed, in spite of the fact that his bid for O level glory had not been a great success and he was due to sit the examinations again. Somehow, he managed to write Hunchback and acquire seven O levels at the same time.

The first job was to design the various screens on paper, of which there are 15 in Hunchback. Machine code routines were then written to print them on to the screen.

"Next I introduced the little man," says Urquart. "He started as a box — a hunchbox — and then became an animated hunchbox. After the man I did the fireballs and arrows."

Hunchback was a direct copy of an existing arcade game, in which Quasimodo, the Hunchback of Notre Dame, has to leap over the battlements and dodge the guards and booby-traps to rescue his beloved Esmerelda from her prison tower. It was a big success in the software charts and continues to sell well, while Urquart and Ward move to new projects.

Ward's philosophy in producing and selling games is direct and aggressive. "We want only good top ten games," he says, "with an even chance of reaching number one." He aims to release two games every two months, with a view to winning a substantial proportion of chart positions in time for Christmas. He believes in big promotions for Ocean games including television and an emphasis on using distributors rather than selling direct to small shops.

"Retail shops are now looking for a service," he says. "A distributor can offer a range of products and gets better feedback and, consequently, a better knowledge of what game will sell."

Aside from his energetic marketing policy, Ward believes his willingness to plough back profits into the company has also paid dividends. He thinks some companies have been too eager to take a fast profit and now find they are losing momentum. Ocean Software now has its own art department and in-house advertising. According to Ward, external advertising agencies do not always have sufficient understanding of the product to produce an effective campaign.

"We went to Saatchi & Saatchi and tried to explain what we were doing. They were thinking in terms of £30 toys which you had to plug in."

Ward insists it is possible to plan deliberately for a top ten game and his schedule of releases in the next few months is designed as a sustained attack on the software charts. One of the more unusual ideas is for a series of Roland Rat games based on the popular TV-am character, to which Ward has acquired the rights. The games — three this year and four in 1985 — will also be advertised on TV-am around the Roland Rat slots for maximum effect and are aimed specifically at a younger market, up to about 10 years of age.

Other plans include the launch of two games which were highly successful in American amusement arcades last summer and a sequel to Hunchback which Ward hopes will appear in September. The company is keeping the nature of the American games secret at present but Ward says they will be instantly recognisable when they appear.

Urquart is working on **Cavelon,** another game from the amusement arcades. In it you are a novice knight who has to negotiate a series of mazes while avoiding the evil knights who try to block your progress. On the way you assemble a door which will allow you to escape from the castle — assuming you survive the final showdown with an evil wizard.

The version of the game I saw suffered from an unsightly bug whereby the evil knights left ghostly images of themselves all over the screen, so it is not really possible to judge the quality of Cavelon yet, but Urquart was confident he could iron out the problems and



Bold Sir Christian Urquart

Cavelon should be available now.

Urquart has left school and works full-time for Ocean Software — the days of toiling with a Spectrum and Microdrives when he should have been doing his homework are past. Ocean Software now uses a souped-up Memotech system with discs to develop its software in common with most software companies which find the Spectrum inconvenient for program development.

Urquart says he does not play much on his Spectrum at home, preferring to write programs, but his favourite game is **The Pyramid.** He still lives with his family in Wallasey and commutes every day to Manchester, where Ocean is based. He claims he is too tired to do much more than go to sleep during the week but likes to go night-clubbing at weekends.

He also enjoys playing snooker and darts and says girls show a good deal more interest in him when they learn how much money he earns. "I never realised how much money there was in it," he says. Urquart is taking driving lessons but whether he intends to emulate his boss and buy the ubiquitous Porsche is another matter.

While Ward strives continually to compete for places in the best-seller charts, Urquart has a more relaxed attitude towards his work. "I don't go all out," he says, "but I try to perfect a game as much as I can. Every program has bugs but I try to get rid of as many as possible."

He is aware of what other programmers are doing, though. "I try to compete — if someone does something better I try to get it into my programs." A certain rivalry seems to be developing between Urquart and Matthew Smith of Software Projects, who also hails from Liverpool. Fans of Smith's new game **Jet Set Willy** may have noticed a room called "I think I've seen this somewhere before" which pokes fun at a scene from Urquart's Hunchback. Urquart says he is plotting his revenge, so keep an eye on any new releases from Ocean for the next stage in this little vendetta between programming folk.

The Ocean duo may seem to make an odd pair — Urquart, the games player fresh out of school, and Ward, the urbane marketing man with his sights fixed firmly on commercial triumph, but when I left, the two were discussing excitedly a game which Urquart had seen in the arcade across the road. Perhaps the programmer and his employer have more in common than meets the eye.

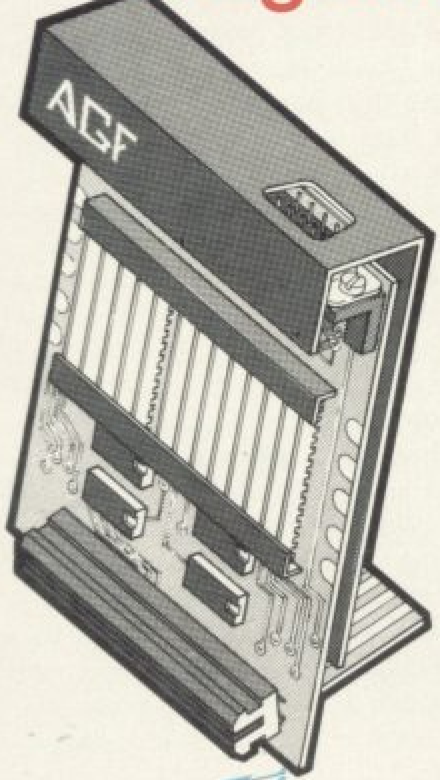
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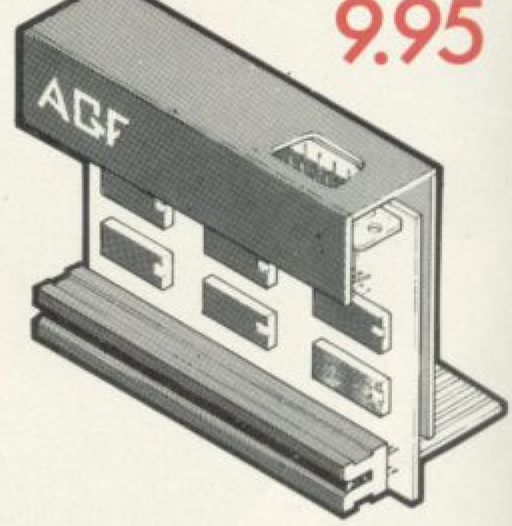
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OVERSEAS PRICES ON APPLICATION

DEALER ENQUIRIES WELCOME

Talking head

Was the premature launch of the QL deliberate? Bill Scolding asks Nigel Searle, head of the computer products division at Sinclair Research.

SINCLAIR RESEARCH has attracted a considerable amount of criticism recently, both from the sceptical computer press and an outraged public who, whether they are waiting impatiently for their new Spectrums to be repaired or waving QL order confirmations yellowed with age, think it is time the company put its house in order.

It seemed, then, an opportune time for *Sinclair User* to seek an interview with managing director Nigel Searle, the man responsible for all business activities of the computer products division. A date was arranged and the letter of confirmation which followed referred mysteriously to Searle's intention to speak on "innovations in the QC area". The QC area? Had Sinclair finally come clean, and, somewhat belatedly, renamed its new offspring the Quantum Cock-up? No doubt all would be revealed at the meeting.

In the event, much to no-one's surprise, little or nothing was revealed. From the beginning things did not bode well. Searle, like the QL, arrived late, accompanied by excuses. There had been, apparently, a crisis, the nature of which Searle declined to disclose. The mind boggled.

The by then seriously abbreviated interview began with matters relating to the new computer and its peculiar exterior EPROM, added at the last minute when Sinclair discovered that the operating system would not fit into the planned 32K. Searle was reluctant to indicate the exact quantity of QLs so far delivered but said that only hundreds had been fitted with the outboard EPROM so, presumably, that gives a fair idea of the number of orders fulfilled.

The new improved QLs with internal ROM would not be ready until sometime in July and Searle implied that the company was waiting for feedback from the first QL users, who had been given the number of a telephone hotline for when they need to let off steam. Criticisms of the machine might pin-point shortcomings which could be remedied before full-scale production began. It is unlikely, then, that most of the 13,000 orders received before the end of April will be met before mid-July.

Why did Sinclair Research launch the QL in January, promising deliveries by the end of February, when it must have been clear that those could not be fulfilled? At that stage even the operating system was incomplete. Searle was ready for that one:

"We were over-optimistic and were two months out in our calculations. Next time we will be two months more accurate in our estimates. Most companies have, at some time, been guilty of promising more than they can deliver. Sinclair Research has done it for the last time."

Was Searle aware that there were rumours to the effect that the QL was launched prematurely to improve the company's end-of-year accounts? Those rumours suggested that when Sinclair puts a quantity of shares on to the Stock Exchange later this year the amount paid for those shares will reflect the profit made by Sinclair in the previous year, ending June, 1984. Customers, who paid £400 for a QL in advance will have contributed more than £1 million towards the company assets, it has been suggested.

"That is totally untrue," Searle replied firmly. "The accounts are unaffected by the money which has been placed in the trust fund. None of the sales can be counted until deliveries have been made."

Turning to the subject of QL software, Searle became animated at the prospects: "Hundreds of titles will be available soon. Even publishers in the U.S. have expressed interest and some are working on software now."

He anticipated that a significant percentage of software will be developed under licence from Sinclair Research, which is offering generous royalty deals to interested houses. The company still planned to maintain its monopoly on the manufacture of cartridges for the QL and Searle believed that that would not cause difficulties in meeting demand.

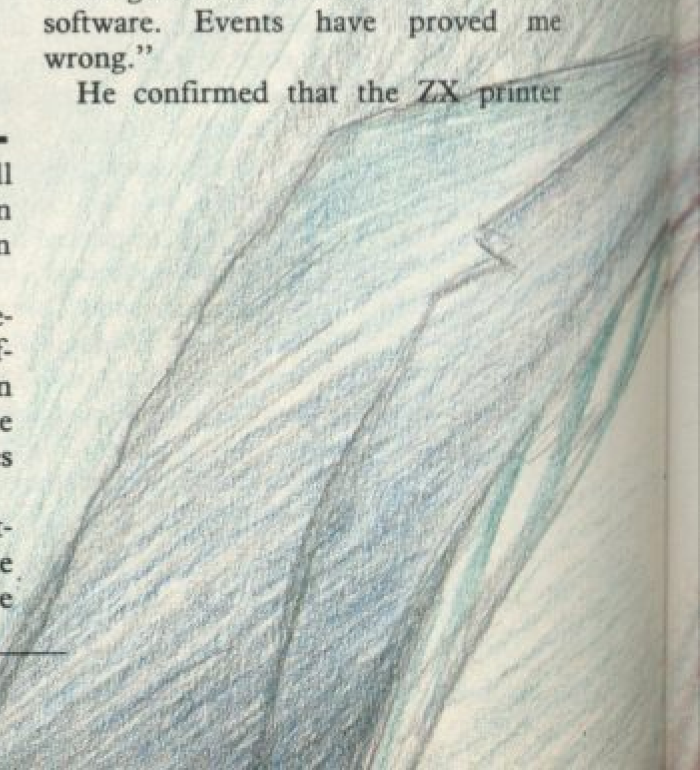
No definite dates for QL peripherals could be given, although he was confident that some would appear before the end of the year. Sinclair did not plan to develop all the add-ons and had been approached by other companies with which it was considering the possibility of joint ventures.

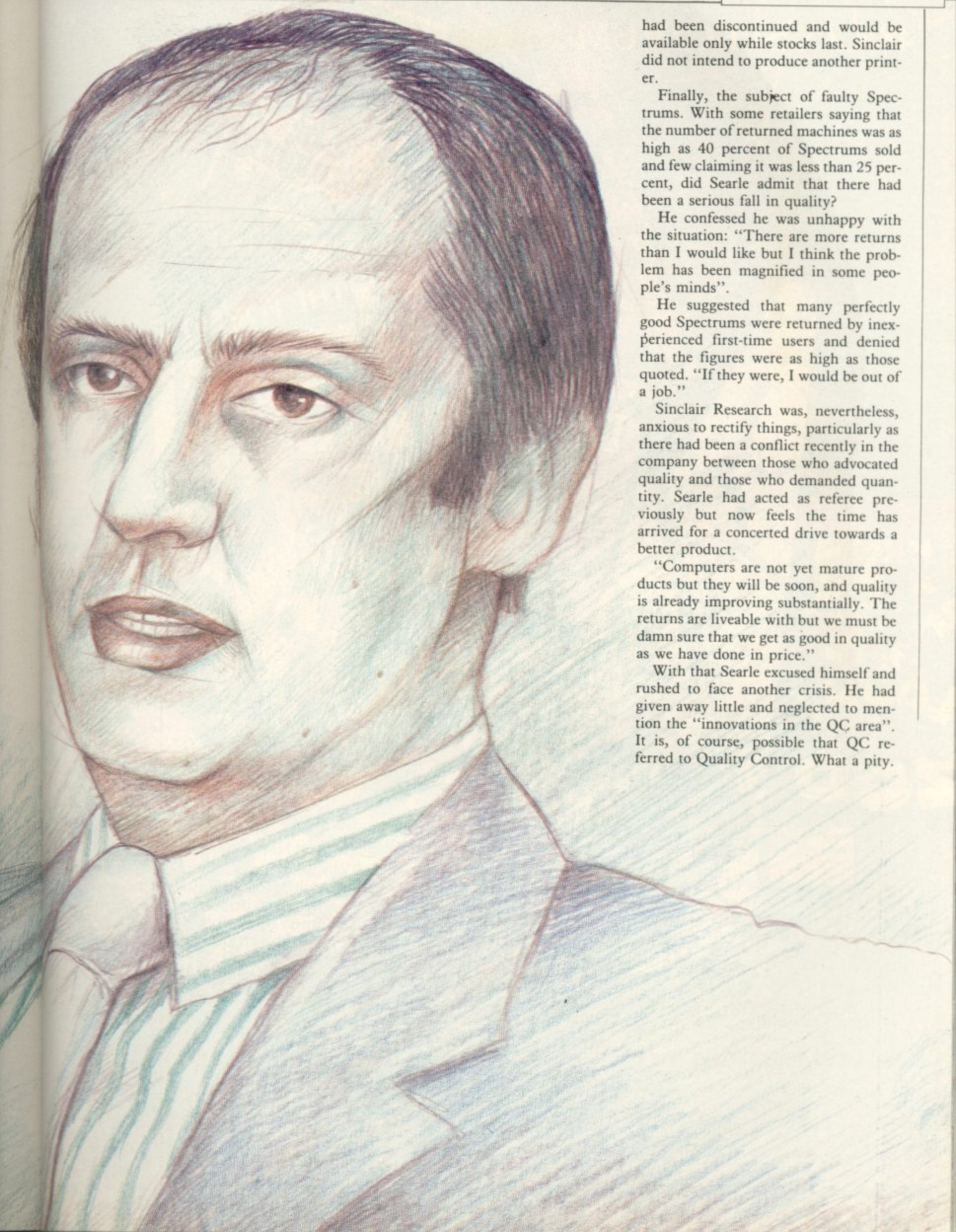
The mention of the recently published book by Boris Allan, *The Sinclair QL Companion*, brought a chuckle from Searle. Though hesitant to advance an opinion on it, he admired the speed at which it had been produced. "If we could get computers out as fast we would have no problems."

Moving away from the QL towards other Sinclair products, Searle revealed that the company has no immediate plans to produce new software for the Interface Two. "There are steady sales at the moment but it is not going to change the world." He seemed to think it had been a mistake: "When it was launched I believed the market was moving towards firmware rather than software. Events have proved me wrong."

He confirmed that the ZX printer

> 'Most companies have, at some time, been guilty of promising more than they can deliver. Sinclair Research has done it for the last time'





had been discontinued and would be available only while stocks last. Sinclair did not intend to produce another printer.

Finally, the subject of faulty Spectrums. With some retailers saying that the number of returned machines was as high as 40 percent of Spectrums sold and few claiming it was less than 25 percent, did Searle admit that there had been a serious fall in quality?

He confessed he was unhappy with the situation: "There are more returns than I would like but I think the problem has been magnified in some people's minds".

He suggested that many perfectly good Spectrums were returned by inexperienced first-time users and denied that the figures were as high as those quoted. "If they were, I would be out of a job."

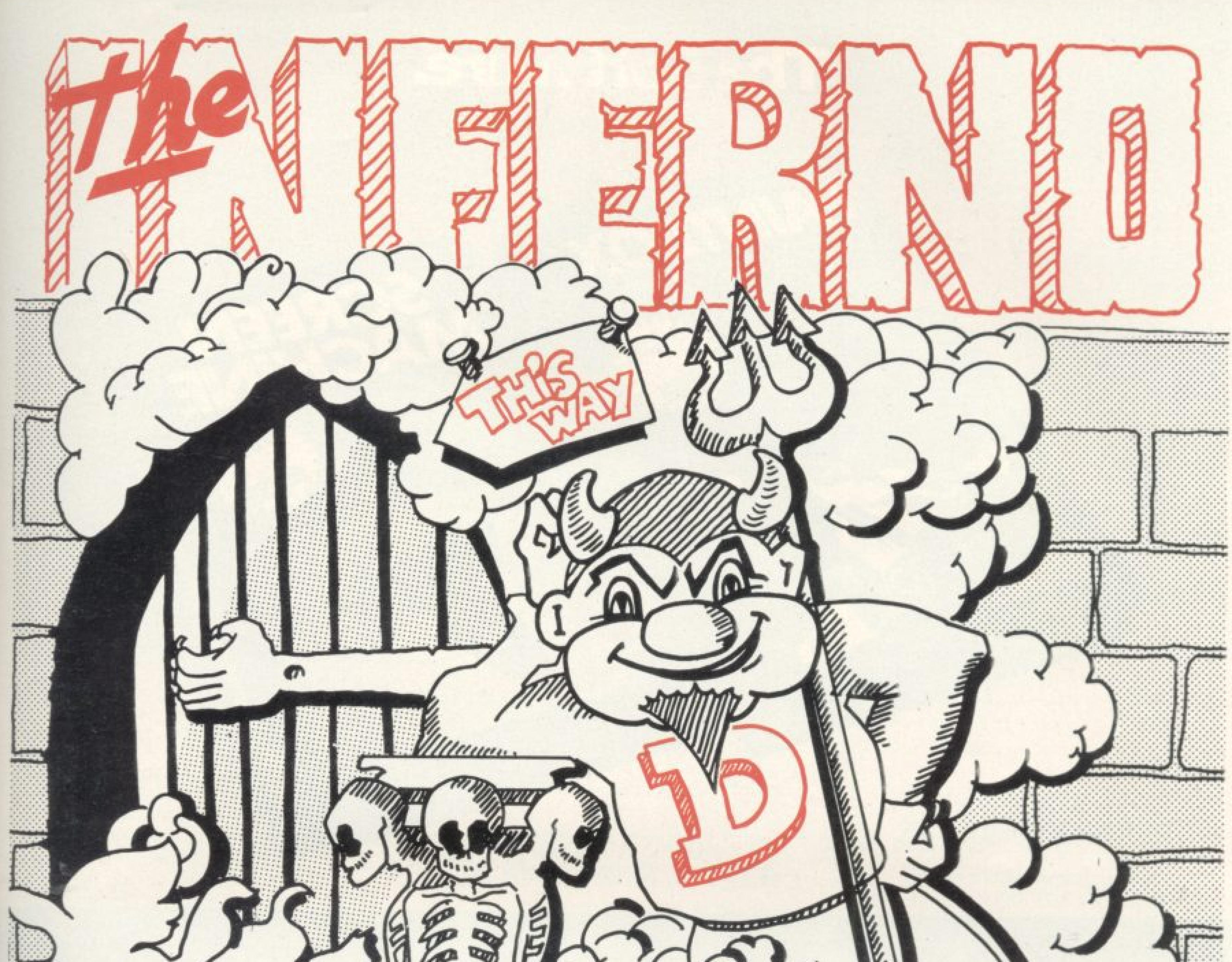
Sinclair Research was, nevertheless, anxious to rectify things, particularly as there had been a conflict recently in the company between those who advocated quality and those who demanded quantity. Searle had acted as referee previously but now feels the time has arrived for a concerted drive towards a better product.

"Computers are not yet mature products but they will be soon, and quality is already improving substantially. The returns are liveable with but we must be damn sure that we get as good in quality as we have done in price."

With that Searle excused himself and rushed to face another crisis. He had given away little and neglected to mention the "innovations in the QC area". It is, of course, possible that QC referred to Quality Control. What a pity.



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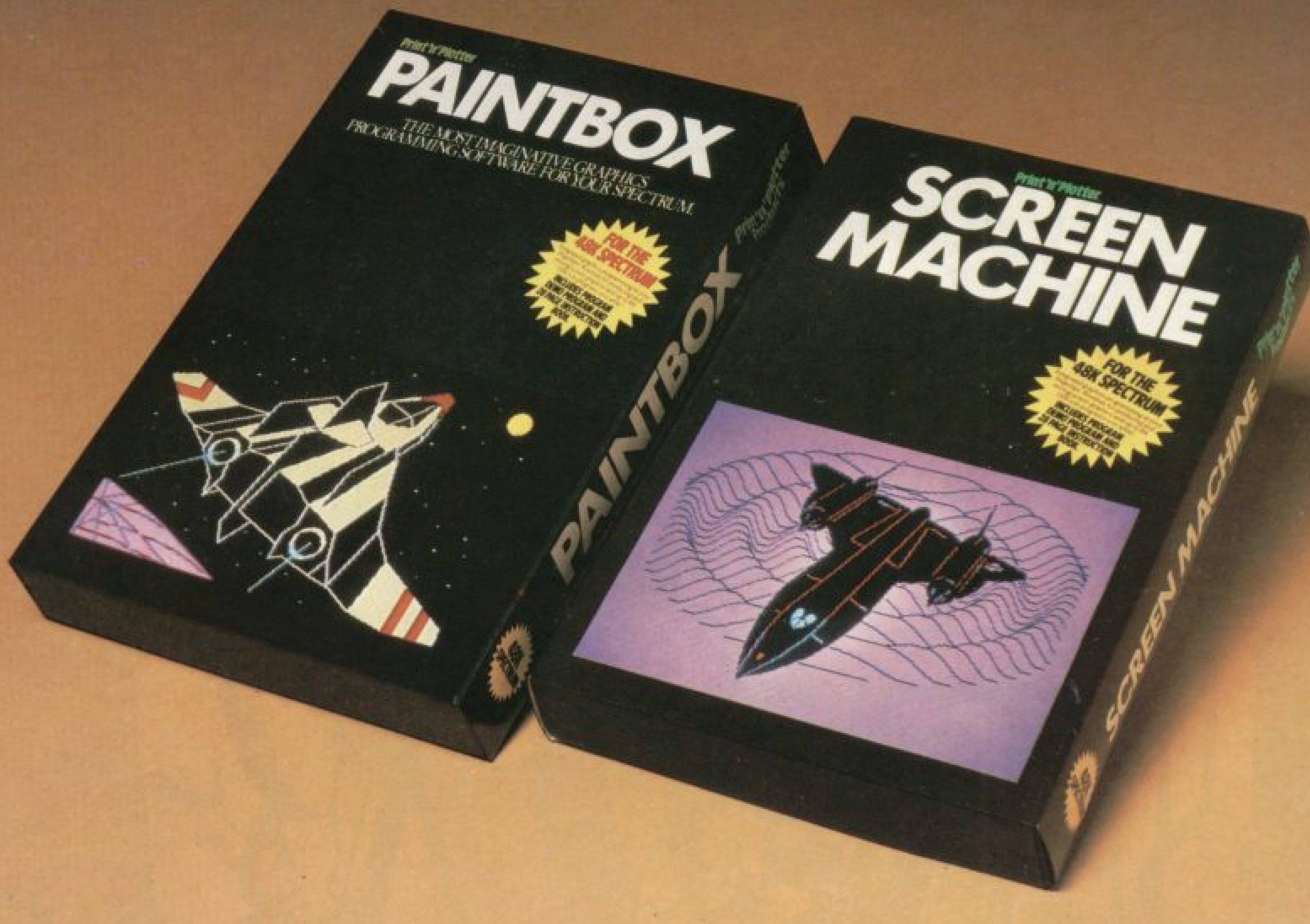
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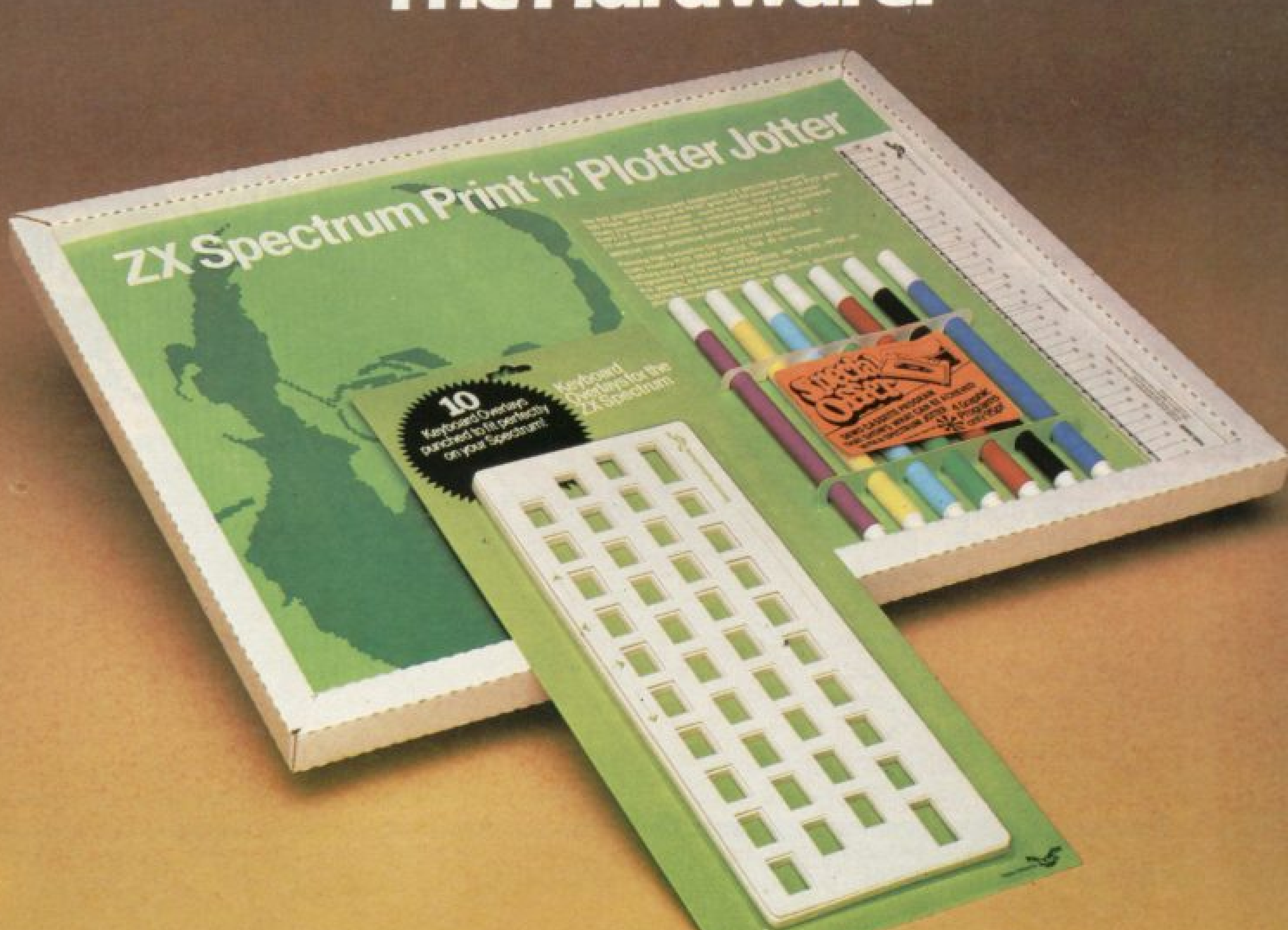
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The Software.



The Hardware.



The Facts.

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Print'n'Plotter Products

THE USE OF games theory as a means to investigate artificial intelligence and learning programs was mentioned in a previous article, published in the April issue of *Sinclair User.* A simple, completely-specified game with full information was chosen as an example, and a program to learn the game was given. Full information means that each player knows or can deduce all the factors which influence play; chance is excluded and the player who adopts the correct strategy wins, if a win is possible. The discovery of that strategy is the object of the learning process.

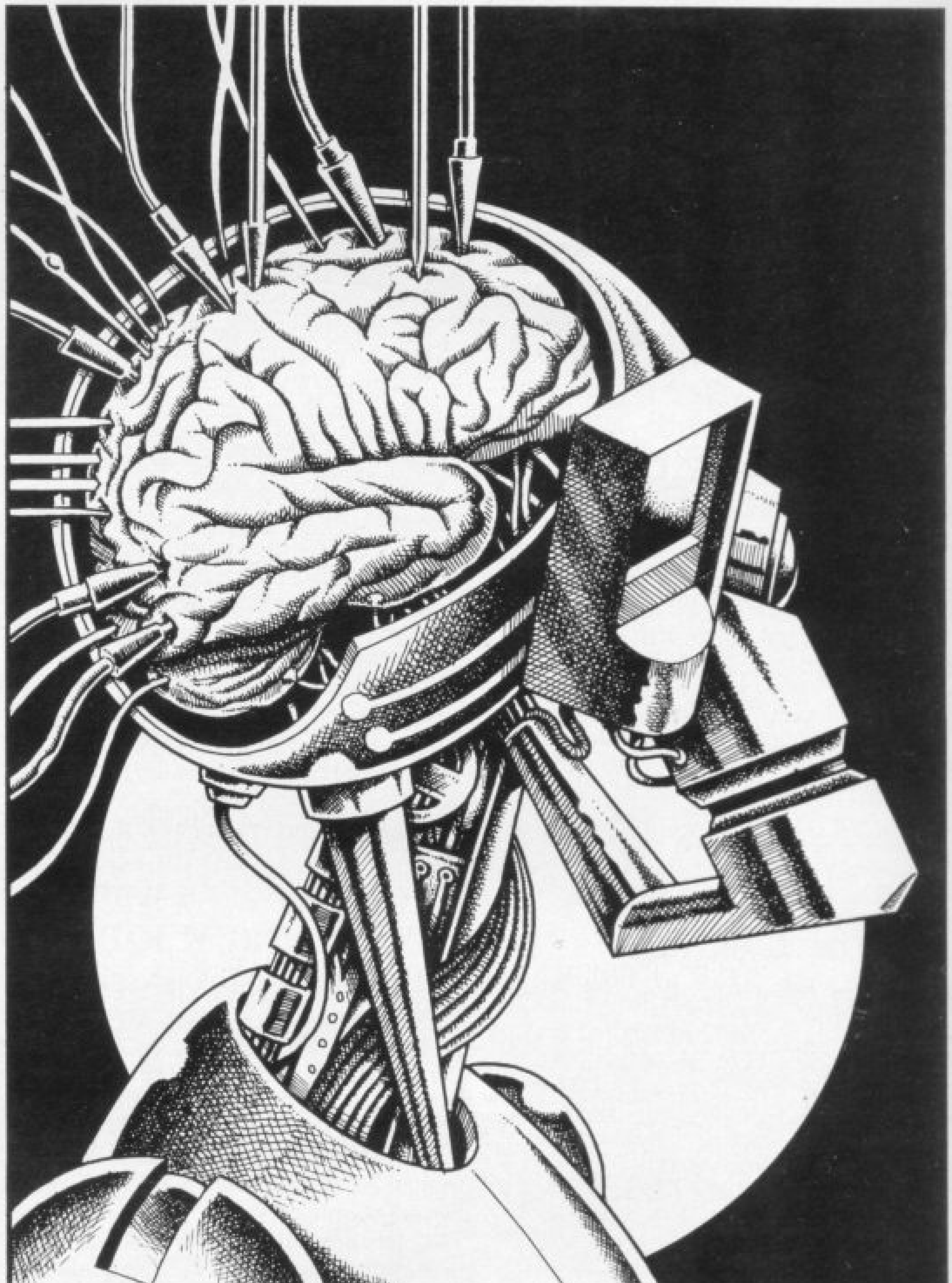
The game consisted of two players taking turns to remove one, two or three objects from a pile containing a given number, the loser taking the last object. Analysis of the game indicates a win for player two if the starting number is a multiple of four plus one, and a win for player one in all other cases.

A possible objection to the original program is that although not instructed explicitly how to play the game, the machine was so instructed by implication, since the perfect compressed strategy was contained in a program line. It could be held that that line represents a kind of 'innate ability', inaccessible to the program at the start, but coming to the fore with experience, but I admit that the objection is a serious one for a more fundamental reason — to write such a line the programmer must know the perfect strategy.

In an incompletely specified game he will not have that knowledge. We must therefore abandon the god-like power to endow machines with innate ability, treat all games as if they were incompletely specified, and write programs which assume nothing about the playing strategy. If a winning strategy exists the program must discover it.

I would like to present a more powerful and generalised program which will learn the game for both players and for any starting number and to suggest some more lines of development. In the new program each player is represented by an N by 5 matrix, where N is the starting number. With the exception of rows one and two, each row contains the numbers one, two and three in the first three columns.

The first two rows contain all ones. A move is made by a random selection from the row whose number equals the number of objects remaining; the selected move is stored in column four and the number of times that particular row has accessed in column five. The program detects the end of the game and jumps to one of two subroutines where the matrices are adjusted according to the result of the game.



The matrices for each player are tested to find the last move made; the moves are identified by non-zero entries in column four. The row corresponding to the last move made by the winner is tested to find an entry different from the winning move; if such as entry exists, it is changed to the winning move; if not, the previous move is tested, and so on.

In the case of the loser, the search is to find the last losing move. An entry in the last losing row is changed to a number different from the losing move. In both cases only one entry is changed per game. To avoid endless adjustments of losing positions, a limit is placed on the number of times a given row may be altered. That is the purpose of column five of the matrix. That limit requires some thought; if it is too low, insufficient scope is given for adjustments to possible winning positions; if too high, the program takes a long time to learn.

After each game a running total of games won and the last row to be altered by each side is printed. A typical line of print looks like this:

4.3.3.3.3.5 4.2.2.3.2.6

That indicates that player one has learned the correct move when four objects remain — i.e., take three — but player two is still learning. It also shows that player one took three on his last attempt at that position and had five attempts at the position, while player two took two and had six attempts. There is an eerie fascination in watching the play move into line with the theoretically correct as the program learns and comes to life. That dawning of intelligence is greatly rewarding for

A *THINKING* MACHINE

Can your Spectrum learn from past mistakes? In a follow-up article to his first, J McAllister demonstrates that the computer is able to discover the winning strategy in a game by analysing its losing moves

those who write artificial intelligence programs even at this level and I would encourage readers to experiment and develop programs for this or other fairly simple games.

An interesting possibility would be to have the program deduce the general rule for the game, the ability to generalise being one of the characteristics of higher intelligence as we know it.

Those interested in developing programs might try draughts on a 4 × 4 board with two men per side, which is easy to analyse and program, or on a 5 × 5 board with three men, which is not so simple. Noughts and crosses should be a good exercise, and an extension of this game, five in a row where each player tries to form lines of five counters vertically, horizontally or diagonally on a 19 × 19 board, provides a real challenge.

Should the full-size game prove too difficult, try three in a row on a 5 × 5 or 6 × 6 board. Those exercises give the programmer useful experience and enable him to formulate ideas for more advanced topics. There are many exciting and perhaps profitable discoveries awaiting the person with the ingenuity and patience to make them.

If you wish to play human against machine, delete either line 100 or line 200 and write some code to input the human move. The lines to adjust the corresponding matrix may also be deleted, though that is not necessary. Unless you have unlimited time and patience, keep the start number fairly low, as it can take more than 100 games for the machine to learn if the start is 20 or more.

Suitable numbers to give a win to player two are 9 and 13, while any of 10, 11 or 12 give a win to player one. As written, the program runs on indefinitely with one player or the other winning all games after the completion of the learning process.

It is easy to stop it in the replay routine by detecting that no further adjustments were made to the matrices. An audible and/or visual indication could be given at that point. An interesting observation is that it is possible to teach the machine an incorrect strategy if you deliberately allow it to win games from losing positions, since it then begins to think that they are winning positions.

That can also happen if the moves for one player are selected at random rather than being programmed to learn the best play for both sides. These observations have an important bearing on programming for AI at a higher level.

Program

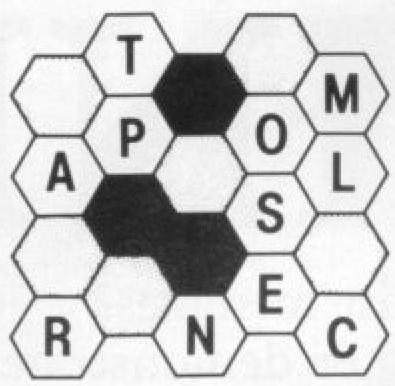
Lines 10 — 50: Initialise. Keep the start number less than 22 if you want a screen printout.
100-300: Select moves for each player, detect games end or go to next move.
700-730: Adjust matrix a if player one wins.
740-780: Adjust matrix b if player one wins.
800-840: Adjust matrix a if player two wins.
850-880: Adjust matrix b if player two wins.
900-920: Print running total and last rows modified. Re-set column four of both matrices and start a new game.

```
  10 LET a=0: LET b=0: LET move=
100: LET awin=700: LET bwin=800:
 LET replay=900
  20 INPUT "start number";nn:: L
ET n=nn: DIM a(n,5): DIM b(n,5)
  30 FOR j=1 TO 3: LET a(1,j)=1:
 LET a(2,j)=1: LET b(1,j)=1: LET
 b(2,j)=1: NEXT j
  40 FOR i=3 TO n: FOR j=1 TO 3:
 LET a(i,j)=j: LET b(i,j)=j: NEX
T j: NEXT i
  50 PRINT AT 0,1;"Player a = ";
AT 0,19;"Player b = "
 100 LET a(n,4)=a(n,INT (1+3*RND
)): LET n=n-a(n,4): IF n=0 THEN
 GO TO bwin
 200 LET b(n,4)=b(n,INT (1+3*RND
)): LET n=n-b(n,4): IF n=0 THEN
 GO TO awin
 300 GO TO move
 700 LET a=a+1: FOR i=3 TO nn: I
F a(i,4)<>0 AND (a(i,1)<>a(i,2)
OR a(i,2)<>a(i,3)) THEN  GO TO 7
20
 710 NEXT i: GO TO 740
 720 FOR j=1 TO 3: IF a(i,j)<>a(
i,4) THEN  LET a(i,j)=a(i,4): LE
T a(i,5)=a(i,5)+1: GO TO 740
 730 NEXT j
 740 FOR k=3 TO nn: IF b(k,4)<>0
 AND b(k,5)<13 THEN  GO TO 760
 750 NEXT k: GO TO replay
 760 FOR j=1 TO 3: IF b(k,j)<>b(
k,4) THEN  NEXT j
 770 IF j<4 THEN  LET b(k,j)=INT
 (1+3*RND): IF b(k,j)=b(k,4) THE
N  GO TO 770
 780 LET b(k,5)=b(k,5)+1: GO TO
replay
 800 LET b=b+1: FOR i=3 TO nn: I
F a(i,4)<>0 AND a(i,5)<13 THEN
GO TO 820
 810 NEXT i: GO TO 850
 820 FOR j=1 TO 3: IF a(i,j)<>a(
i,4) THEN  NEXT j
 830 IF j<4 THEN  LET a(i,j)=INT
 (1+3*RND): IF a(i,j)=a(i,4) THE
N  GO TO 830
 840 LET a(i,5)=a(i,5)+1
 850 FOR k=3 TO nn: IF b(k,4)<>0
 AND (b(k,1)<>b(k,2) OR b(k,2)<>
b(k,3)) THEN  GO TO 870
 860 NEXT k: GO TO replay
 870 FOR j=1 TO 3: IF b(k,j)<>b(
k,4) THEN  LET b(k,j)=b(k,4): LE
T b(k,5)=b(k,5)+1: GO TO replay
 880 NEXT j
 900 LET n=nn: IF i<=nn THEN  PR
INT AT i,1;i;: FOR j=1 TO 5: PRI
NT ".";a(i,j);: NEXT j
 910 IF k<=nn THEN  PRINT AT k,1
9;k;: FOR j=1 TO 5: PRINT ".";b(
k,j);: NEXT j
 920 FOR i=3 TO nn: LET a(i,4)=0
: LET b(i,4)=0: NEXT i: PRINT AT
 0,11;a;AT 0,29;b: GO TO move
```

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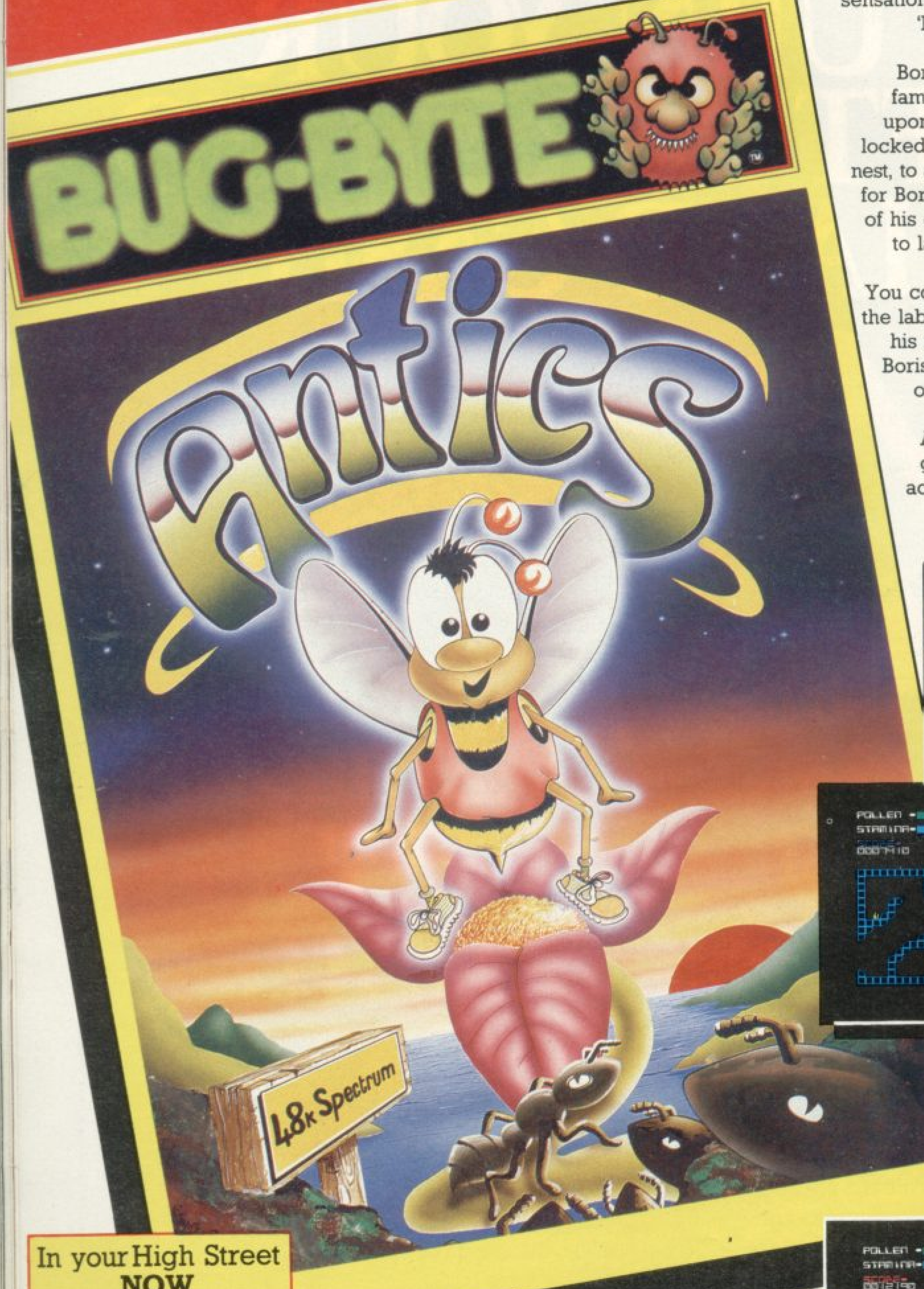


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ZX Spectrum 48K

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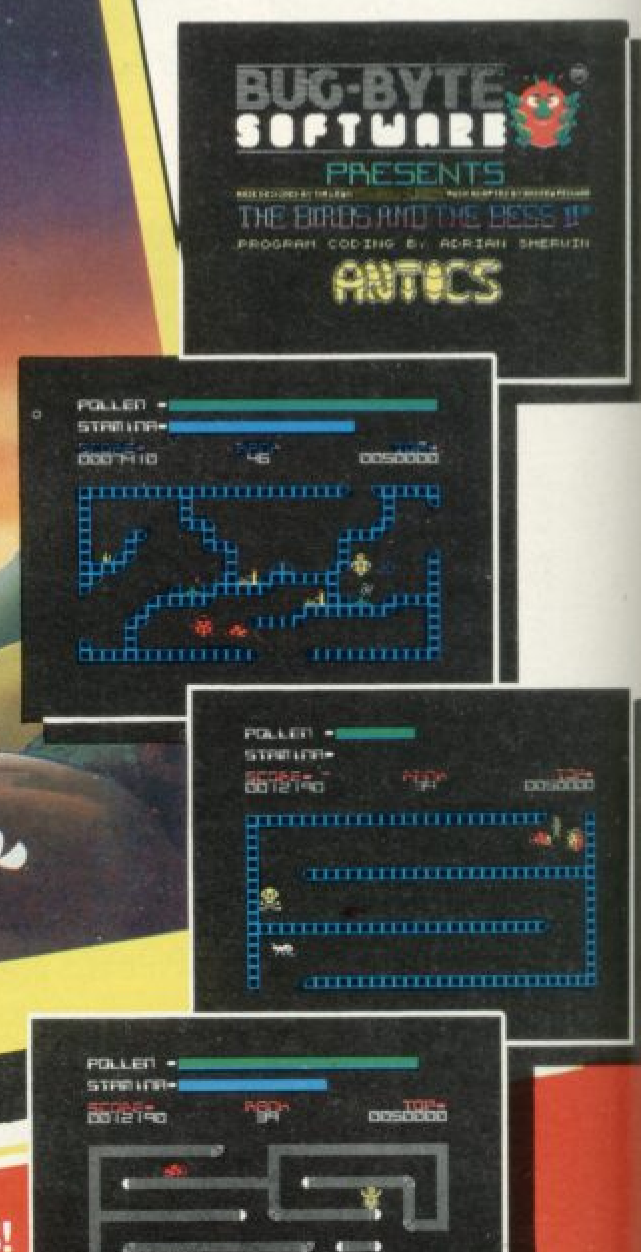


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PROGRAM PRINTOUT

GRAPHICS INSTRUCTIONS

Instructions for graphics characters are printed in lower-case letters in our listings. They are enclosed by brackets and separated by colons to distinguish them and the brackets and colons should not be entered.

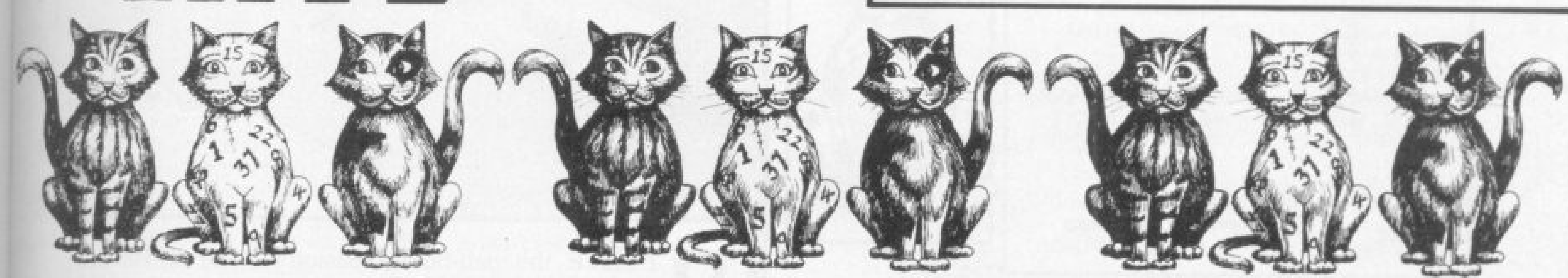
Inverse characters are represented by the letter "i" and graphics characters by "g". Thus an inverse W would be represented by "iw", a graphics W by "gw", and an inverse graphics W by "igw".

Spaces are represented by "sp" and inverse spaces by "isp". Whenever any character is to be used more than once, the number of times it is to be used is shown before it, together with a multiplication sign. Thus "6*isp" means six inverse spaces and "(g4:4*i4:g3)" would be entered as a graphic four, followed by an inverse four repeated four times, followed by a graphics three.

Where whole words are to be written in inverse letters they appear in the listings as lower-case letters. Letters to be entered in graphics mode on the Spectrum are underlined.

Inverse characters may be entered on the ZX-81 by changing to graphics mode and then typing the appropriate characters and on the Spectrum by changing to inverse video and typing the appropriate letters. Graphics characters may be entered on the ZX-81 by changing to graphics mode and then pressing symbol shift while the appropriate characters are entered. On the Spectrum graphics characters may be obtained by changing to graphics mode and then pressing the appropriate character. User-defined graphics will appear as normal letters until the program has been RUN.

COUNTING CATS



COUNTING CATS, for the 48K Spectrum, by Carl Gray of Leeds is an educational program for very small children. The program displays a number of cats for the child to count; you can set the upper limit to anything between 1 and 60.

The printout uses special graphics instructions detailed above.

```
  5 REM Counting Cats by Carl G
ray, 1983.
  10 REM cat user-defined graphi
cs,  c=C ,t=T , so ct=CT the lit
tle cat !
  20 LET a=BIN 11111100: LET b=B
IN 10110100: LET c=BIN 11111111:
 LET d=BIN 10000111: LET f=BIN 0
1001000: LET g=BIN 01001000
  30 LET h=BIN 11111110: LET i=B
IN 00000010: LET j=BIN 00010010:
 LET k=BIN 00100010: LET l=BIN 0
1000010
  40 POKE USR "c",a: POKE USR "c
"+1,b: ROKE USR "c"+2,c: POKE US
R "c"+3,d: POKE USR "c"+4,c: POK
E USR "c"+5,f: POKE USR "c"+6,f:
 POKE USR "c"+7,g
  50 POKE USR "t",h: POKE USR "t
"+1,i: POKE USR "t"+2,h: POKE US
R "t"+3,h: POKE USR "t"+4,h: POK
E USR "t"+5,j: POKE USR "t"+6,k:
 POKE USR "t"+7,l
  60 REM introduction
  65 PAPER 7: INK 2
  71 PRINT AT 6,3; INK 5;"CTCTCT
CTCTCTCTCTCTCTCT": GO SUB 9100:
PRINT  INK 5;TAB 3;"CT  COUNTING
  CATS  CT": PRINT  INK 5;;TAB 3
;"CTCTCTCTCTCTCTCTCTCTCTCT": PAUSE
 250
  80 PRINT AT 20,0;"Press any'ke
y to START"
  90 PAUSE 0
  95 PAPER 7: INK 3
 100 CLS : PRINT "Here is a cat"
 101 PRINT : PRINT
 110 GO SUB 9000
 120 PRINT : PRINT "It is a big
cat !": PRINT
 130 PRINT "He is called Towser
!": PRINT
 140 PRINT "Here is a very small
 cat :  CT": PRINT : PRINT "Pres
s any key to continue"
 150 PAUSE 0
 160 CLS : PRINT "CT  She is cal
led Pearl !": PRINT
 170 PRINT "Do you want to play
a game with"'" some more cats ?
": PRINT
 180 INPUT "If so,  press the ""
Y"" button; "'" if not just pres
s the ""N"" "'"button"'"Press it
 now, and then press"'"'""Enter"
"",q$
 190 IF q$="n" THEN  GO TO 10
 200 IF q$="y" THEN  GO TO 210
 210 CLS : PRINT "Good.  I'm gla
d you decided to"'" play at ": P
RINT AT 4,14; FLASH 1;"CATS"
 220 CLS : INPUT "Now tell me yo
ur name (or names if there are m
ore than one)."'"Just type it or
 them in now,"'"  and then ""Ent
er"""'n$
 230 PAPER 7: INK 5
 240 CLS : PRINT "But before we
start,  ";n$;","'"you must decid
e which"'"number to count up to
!"
 250 PRINT : PRINT "Press the bu
ttons for the"'" biggest number
you want.  "'"How about up to 10
, 20 or 50 ?": PAUSE 100,
 260 PRINT "Just type it in now
and then"'" ""Enter""": INPUT l
imit: CLS
 270 IF limit>60 THEN  PRINT "In
 fact it must be"'"a number no m
ore than 60"'"Try again !": PAUS
E 250: CLS : GO TO 250
 275 IF limit<=60 THEN  PAUSE 50
: GO TO 280
 280 REM random-tabulated-cats-g
enerator !
 285 PAPER 7: INK 3
 290 LET score=0
 300 FOR c=1 TO 10
 305 LET rn=1+INT (RND*limit)
 306 IF rn<=10 THEN  GO TO 320
 307 IF rn>10 AND rn<=20 THEN  G
O TO 360
 308 IF rn>20 AND rn<=30 THEN  G
O TO 430
 309 IF rn>30 AND rn<=40 THEN  G
O TO 500
 310 IF rn>40 AND rn<=50 THEN  G
O TO 570
 320 GO SUB 9060: FOR n=1 TO rn
 330 PRINT "CT ": PRINT
 340 NEXT n
 350 GO TO 700
 360 GO SUB 9060: FOR n=1 TO (rn
-10)
 370 PRINT "CT ";TAB 5;"CT ": PR
INT
 380 NEXT n
 390 FOR m=(rn-9) TO 10
 400 PRINT "CT ": PRINT
 410 NEXT m
 420 GO TO 700
 430 GO SUB 9060: FOR n=1 TO (rn
-20)
 440 PRINT "CT ";TAB 5;"CT ";TAB
 10;"CT ": PRINT
 450 NEXT n
 460 FOR m=(rn-19) TO 10
 470 PRINT "CT ";TAB 5;"CT ": PR
INT
 480 NEXT m
 490 GO TO 700
 500 GO SUB 9060: FOR n=1 TO (rn
-30)
 510 PRINT "CT ";TAB 5;"CT ";TAB
 10;"CT ";TAB 15;"CT ": PRINT
 520 NEXT n
 530 FOR m=(rn-29) TO 10
 540 PRINT "CT ";TAB 5;"CT ";TAB
 10;"CT ": PRINT
 550 NEXT m
 560 GO TO 700
 570 GO SUB 9060: FOR n=1 TO (rn
-40)
 575 PRINT "CT ";TAB 5;"CT ";TAB
```

continued on page 68

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```
 10;"CT ";TAB 15;"CT ";TAB 20;"C
T ": PRINT
 580 NEXT n
 590 FOR m=(rn-39) TO 10
 600 PRINT "CT ";TAB 5;"CT ";TAB
 10;"CT ";TAB 15;"CT ": PRINT
 610 NEXT m
 620 GO TO 700
 700 REM answers
 705 PAPER 7: INK 4
 710 INPU; INK 5;"How many cats
 ?    ";g$
 720 IF VAL g$=rn THEN  LET scor
e=score+1: GO TO 800
 730 IF VAL g$<rn THEN  GO TO 74
0
 735 IF VAL g$>rn THEN  GO TO 77
0
 740 REM answer too low
 741 PAPER 0: INK 2: INPUT "NO !
 TOO LOW ! TRY AGAIN:          How
 many cats ?   ";g$
 742 GO TO 720
 770 REM answer too high
 771 PAPER 7: INK 1: INPUT "NO !
 TOO HIGH ! TRY AGAIN:          H
ow many cats ?     ";g$
 772 GO TO 720
 800 REM reward sequence !
 810 CLS : GO SUB 9060: PRINT :
GO SUB 9000
 820 PRINT
 830 PAPER 7: INK 3: PRINT "VERY
 GOOD ";n$;" !": PRINT : PRINT
 840 PRINT "YES, THE NUMBER WAS:
": PRINT : PRINT
 850 GO SUB 9050
 860 IF rn>=10 THEN  GO TO 890
 870 IF rn<10 THEN  GO TO 880
 880 PRINT  INK 4;TAB 12; FLASH
```



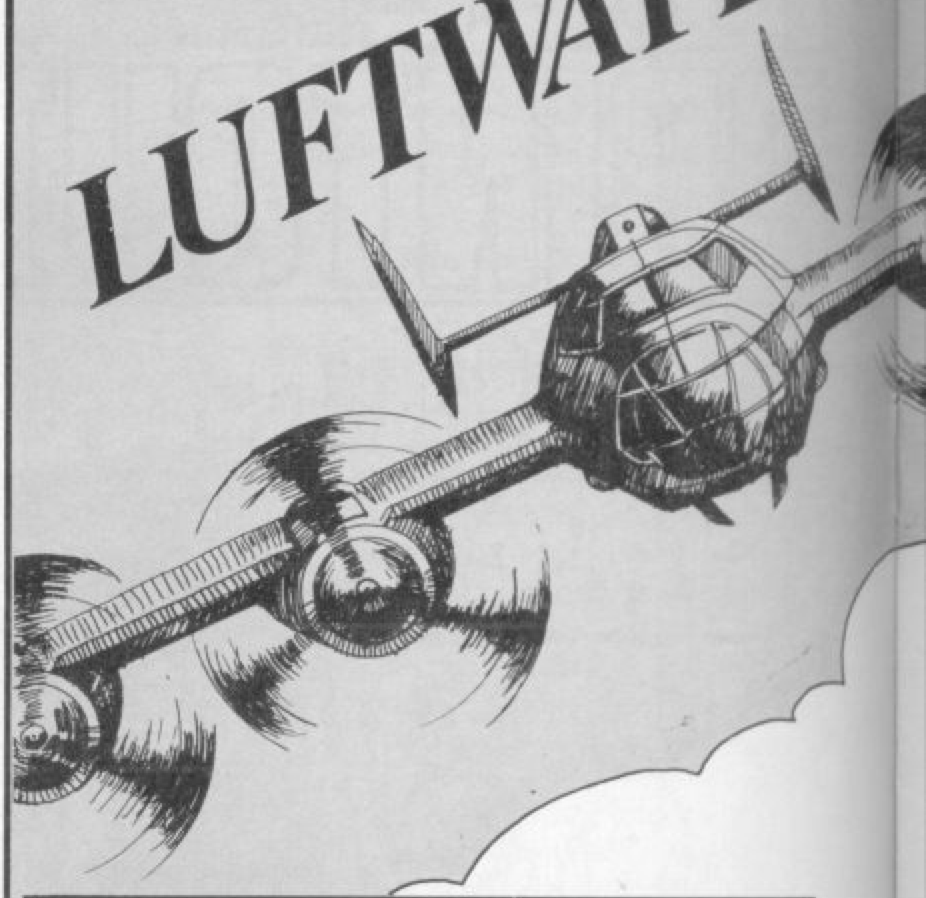


```
1;"*"; INK 2; FLASH 0;" ";rn; FL
ASH 1; INK 4;"*": GO TO 900
 890 PRINT  INK 4;TAB 12; FLASH
1;"*"; INK 2; FLASH 0;rn; INK 4;
 FLASH 1;"*"
 900 GO SUB 9050
 910 PRINT : PRINT  INK 5;"Press
 any key to continue": PAUSE 0
 920 IF c=10 THEN  GO TO 940
 930 CLS : NEXT c
 940 REM final score !
 950 CLS : PRINT  INK 2;n$; INK
1;"'s SCORE was:"''; INK 3; FLAS
H 1;score; INK 1; FLASH 0;" out
of 10"''"counts"''"RIGHT FIRST T
IME"; FLASH 1;"!"
 960 PRINT : PRINT
1040 PRINT "Do you want to do"'"
any more ?": INPUT "Enter ""y""
for yes, ""n"" for no";c$
1050 IF c$="y" THEN  CLS : GO TO
 240
1060 IF c$<>"y" THEN  GO TO 1070
1080 CLS : STOP
9000 LET x=10: PRINT  INK 1;TAB
x;"          "'TAB x;"
      "'TAB x;"
   "'     TAB x;"
 "'TAB x;"           "'
TAB x;"          "'TAB x;"
        "
9001 RETURN
9050 PRINT  INK 4;TAB 12; FLASH
1;"****"
9051 RETURN
9060 PRINT  INK 3;"COUNT THE CAT
S       Try no.";c: PRINT
9061 RETURN
9100 LET x=3: PRINT  INK 5;TAB x
;"CT                  CT
"'TAB x;"CT
     CT"'TAB x;"CT
         CT"'TAB x;"CT
            CT"'TAB x;"CT
                  CT"'TA
B x;"CT
CT"'TAB x;"CT
      CT"
9110 RETURN
```



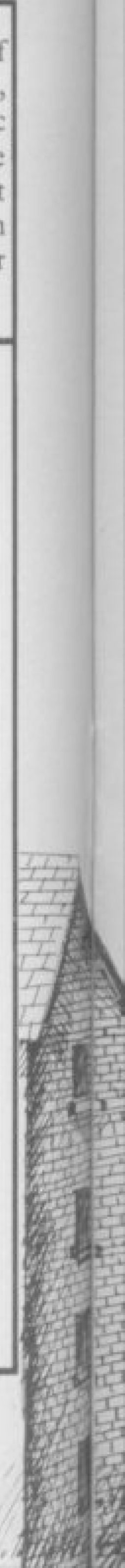


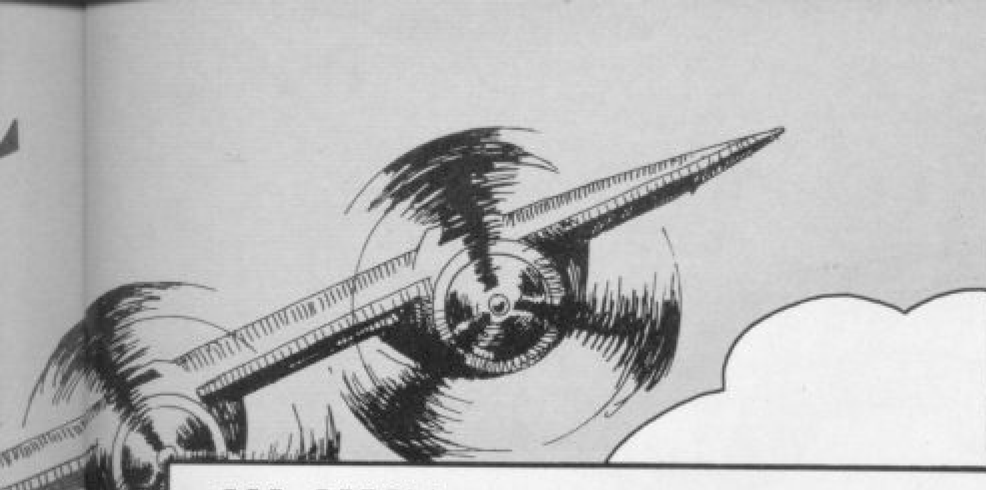
LUFTWAFFE



RE-LIVE the nail-biting tension of the Battle of Britain in **Luftwaffe** by Jason Currie of Thame, Oxfordshire for the 16K ZX-81. It is a strategic game in which you must counter the waves of Luftwaffe bombers by deciding how many aircraft to scramble against them. You must also decide where to spend your slim budget to best advantage. Will you buy more aircraft or repair bombed factories and airfields?

```
  10 LET E=0
  20 LET F=0
  30 LET G=0
  40 LET I=1
  50 LET A1=800
  55 LET A2=15
  60 LET A3=20
  65 LET A4=10
  70 LET B1=1500
  75 LET B2=30
  80 RAND
 110 PRINT
 120 PRINT
 130 PRINT "DEAR COMMANDER,",,"
               YOU HAVE BEEN","GI
VEN A SQUADRON OF NEW PLANES","W
ITH WHICH I EXPECT YOU TO","BLOW
 THE HUNS OUT OF THE SKY."
 140 PRINT " YOU HAVE 30 WEEKS I
N WHICH TO","DO THIS,SO DO IT PR
OPERLY."," INTELLIGENCE ESTIMATE
S THE HUNS";"TO HAVE AROUND 1,50
0 PLANES,","AND SO WE""VE GIVEN
YOU 800 FOR","STARTERS."
 150 PRINT " GOOD LUCK,OLD CHAP;
PRESS A KEY","TO CONTINUE.
                        SIGNED,"
 160 PRINT "                 W.CH
URCHILL"
 170 IF INKEY$="" THEN GOTO 170
 180 SCROLL
 190 PRINT
 200 SCROLL
 210 PRINT "********************
***********"
```

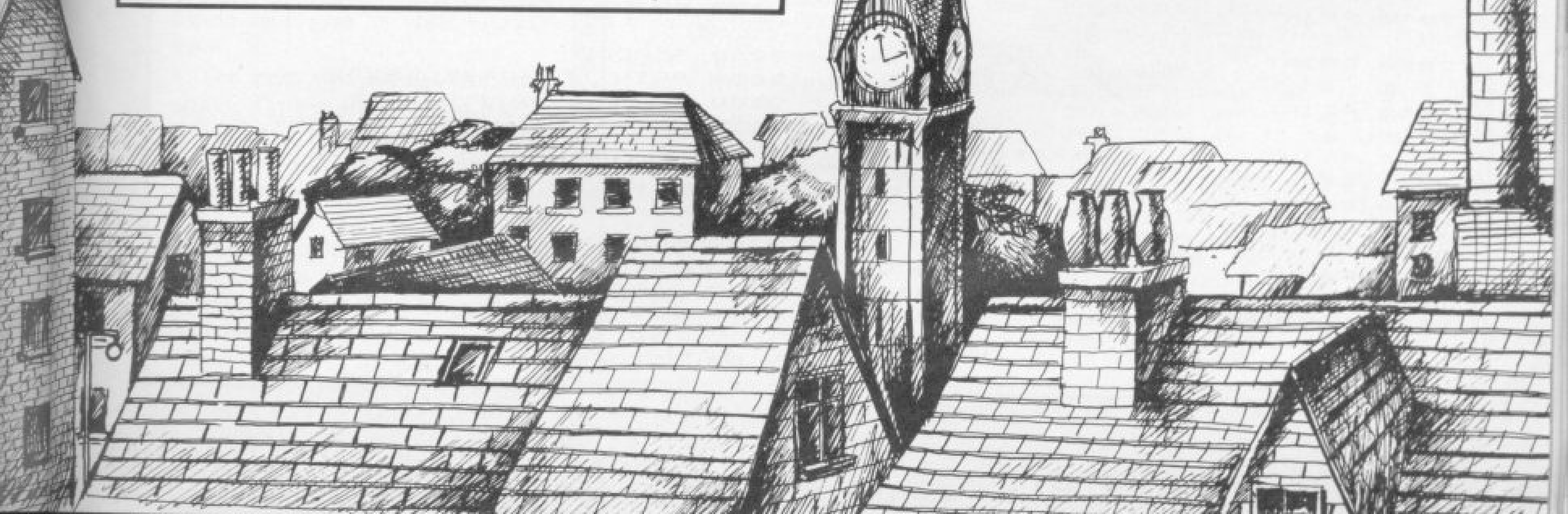


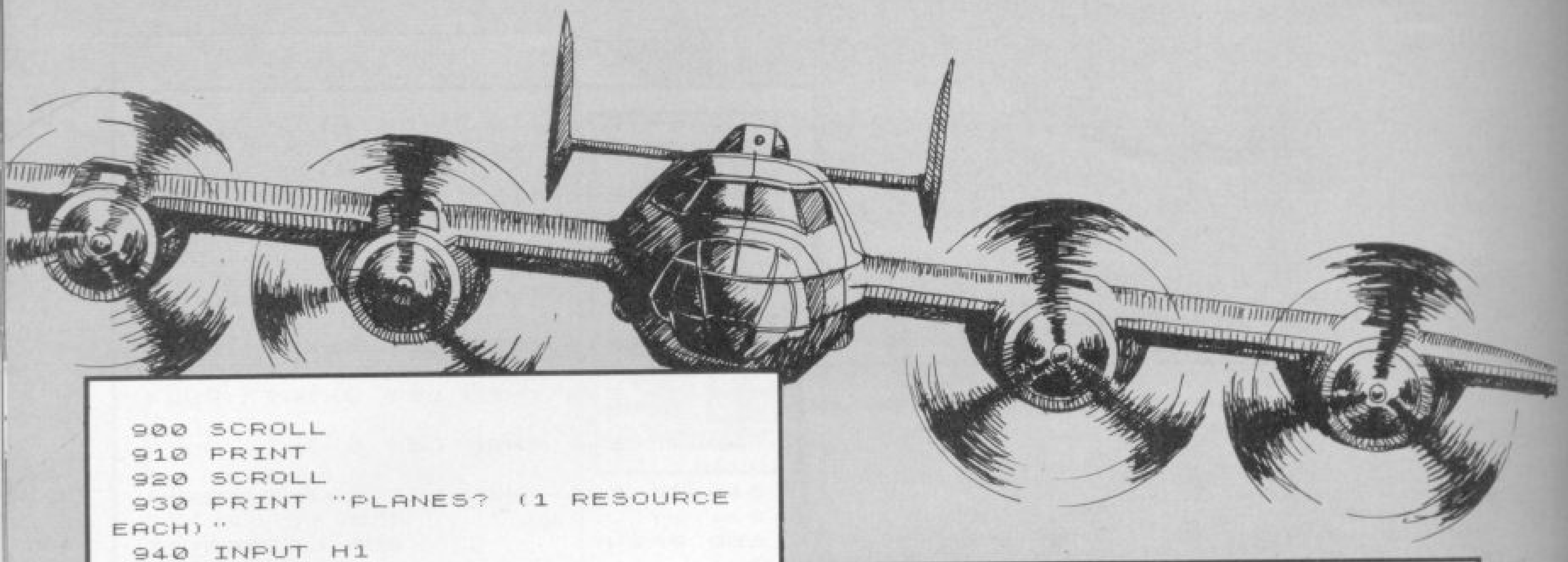


```
 220 SCROLL
 230 PRINT
 232 SCROLL
 234 PRINT "              WEEK ";I
 236 SCROLL
 238 PRINT
 240 SCROLL
 245 LET C=INT (RND*B1)
 250 IF A4<3 THEN PRINT "SIR;A H
UN FORCE IS COMING BUT WE"
 260 IF A4<3 THEN SCROLL
 270 IF A4<3 THEN PRINT "DON""T
KNOW HOW MANY BECAUSE WE"
 280 IF A4<3 THEN SCROLL
 290 IF A4<3 THEN PRINT "HAVEN""
T GOT ENOUGH RADARS."
 300 IF A4<3 THEN GOTO 340
 310 PRINT "SIR;THE RADARS SHOW
A HUN FORCE"
 320 SCROLL
 330 PRINT "OF ";C;" PLANES ATTA
CKING."
 340 IF C<=1 THEN GOTO 760
 350 SCROLL
 360 PRINT
 370 SCROLL
 380 PRINT "HOW MANY PLANES TO S
CRAMBLE,SIR?"
 390 SCROLL
 400 PRINT
 410 SCROLL
 420 INPUT D
 430 IF D>A1 THEN PRINT "YOU ONL
Y HAVE ";A1
 440 IF D>A1 THEN SCROLL
 450 IF D>A1 THEN GOTO 360
 452 IF D>A2*50 THEN PRINT "EACH
 AIRFIELD CAN ONLY SERVE"
 454 IF D>A2*50 THEN SCROLL
 455 IF D>A2*50 THEN PRINT "FOR
50 PLANES."
 456 IF D>A2*50 THEN GOTO 350
 460 PRINT D
 470 SCROLL
 480 PRINT
 490 SCROLL
 500 IF D>=2*C THEN LET E=1
 510 IF D<=C/2 THEN LET E=2
 520 IF D<C THEN LET E=3
 530 IF D>C THEN LET E=4
 540 IF D=C THEN LET E=5
 550 IF E=1 THEN LET F=INT (RND*
(C/2))+(C/2)
 560 IF E=1 THEN LET G=INT (RND*
(D/2))+(D/2)
 570 IF E=2 THEN LET F=INT (RND*
(C/4))
 580 IF E=2 THEN LET G=INT (RND*
(D/2))+(D/2)
 590 IF E=3 THEN LET G=INT (RND*
(D/2))
 600 IF E=3 THEN LET F=INT (RND*
(C/4))
 610 IF E=4 THEN LET F=INT (RND*
(C/2))
 620 IF E=4 THEN LET G=INT (RND*
(D/4))
 630 IF E=5 THEN LET G=INT (RND*
(D/4))
 640 IF E=5 THEN LET F=INT (RND*
(C/4))
 650 PRINT "          YOUR LOSSES; "
;G
 660 SCROLL
 670 PRINT "           HUN LOSSES; "
;F
 680 SCROLL
 690 PRINT
 700 SCROLL
 710 LET A1=A1-G
 720 LET B1=B1-F
 725 GOSUB 9000
 730 PRINT "INTELLIGENCE ESTIMAT
ES THE HUNS"
 740 SCROLL
 750 PRINT "HAVE ";B1;" PLANES."

 760 SCROLL
 770 PRINT
 780 SCROLL
 790 PRINT " YOU HAVE:   ";A1;" P
LANES,"
 800 SCROLL
 810 PRINT "                 ";A2;"
AIRFIELDS,"
 820 SCROLL
 830 PRINT "                 ";A3;"
FACTORIES,"
 840 SCROLL
 850 PRINT "        AND      ";A4;"
RADARS."
 860 SCROLL
 870 PRINT
 880 SCROLL
 885 LET A5=INT (RND*100)+50
 890 PRINT "YOU HAVE ";A5;" RESO
URCES TO USE."
```

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```
 900 SCROLL
 910 PRINT
 920 SCROLL
 930 PRINT "PLANES? (1 RESOURCE
EACH)"
 940 INPUT H1
 950 SCROLL
 960 PRINT H1
 970 SCROLL
 980 PRINT "AIRFIELDS? (20 RESOU
RCES EACH)"
 990 INPUT H2
1000 SCROLL
1010 PRINT H2
1020 SCROLL
1030 PRINT "FACTORIES? (25 RESOU
RCES EACH)"
1040 INPUT H3
1050 SCROLL
1060 PRINT H3
1070 SCROLL
1080 PRINT "RADARS? (10 RESOURCE
S EACH)"
1090 INPUT H4
1100 SCROLL
1110 PRINT H4
1120 SCROLL
1130 PRINT
1140 SCROLL
1150 IF H1+(H2*20)+(H3*25)+(H4*1
0)>A5 THEN GOTO 890
1155 IF H1>A3*20 THEN SCROLL
1160 IF H1>A3*20 THEN PRINT "NOT
 ENOUGH FACTORIES."
1163 IF H1>A3*20 THEN SCROLL
1164 IF H1>A3*20 THEN PRINT
1165 IF H1>A3*20 THEN SCROLL
1170 IF H1>A3*20 THEN GOTO 890
1180 LET A1=A1+H1
1190 LET A2=A2+H2
1200 LET A3=A3+H3
1210 LET A4=A4+H4
1220 LET B1=B1+30
1230 IF B1<=30 THEN GOTO 8000
1240 LET I=I+1
1250 IF I=31 THEN GOTO 7000
1260 IF A1-H1<=0 THEN GOTO 7000
1270 GOTO 180
7000 FOR F=0 TO 21
7010 SCROLL
7020 NEXT F
7030 PRINT AT 0,0;"       *******
**************"
7040 PRINT "        *
      *"
7050 PRINT "        *  Y O U   L O
 S E  *"
7060 PRINT "        *
      *"
7070 PRINT "        **************
*******"
7080 PRINT
7090 PRINT
7100 PRINT "YOU FOOL..."
7110 PRINT "              YOU HAVE
LET THE HUNS";"BEAT US IN THIS M
OST IMPORTANT","WAR;",,"YOU""RE
FIRED."
7120 PRINT
7130 PRINT " IF YOU WANT TO REDE
EM YOURSELF,","THEN TRY AGAIN BY
 PRESSING ANY","KEY."
7140 IF INKEY$="" THEN GOTO 7140

7145 CLS
7150 GOTO 2
8000 FOR F=0 TO 21
8010 SCROLL
8020 NEXT F
8030 PRINT AT 0,0;"        ******
*************"
8040 PRINT "        *
      *"
8050 PRINT "        *  Y O U   W
I N  *"
8060 PRINT "        *
      *"
8070 PRINT "        *************
******"
8080 PRINT
8090 PRINT
8100 PRINT "WELL DONE..."
8110 PRINT "              YOU MANAG
ED TO","OUTSMART THE HUNS;"
8120 PRINT " YOU""VE BEEN PROMOT
ED TO MAJOR."
8130 PRINT
8140 PRINT "PRESS ANY KEY FOR AN
OTHER","MISSION"
8150 IF INKEY$="" THEN GOTO 8150

8155 CLS
8160 GOTO 2
9000 LET J=INT (RND*11)
9010 IF J>=9 THEN RETURN
9014 IF J>2 THEN GOTO 9065
9020 PRINT "THE HUNS ALSO BOMBED
 SOME "
9030 SCROLL
9040 PRINT "FACTORIES."
9050 SCROLL
9055 LET A3=A3-(INT (RND*A3/2)+1
)
9060 RETURN
9065 IF J>5 THEN GOTO 9130
9070 PRINT "THE HUNS ALSO BOMBED
 SOME"
9080 SCROLL
9090 PRINT "AIRFIELDS."
9100 SCROLL
9110 LET A2=A2-(INT (RND*A2/2)+1
)
9120 RETURN
9130 PRINT "THE HUNS ALSO BOMBED
 SOME"
9132 SCROLL
9136 PRINT "RADARS."
9138 SCROLL
9150 LET A4=A4-(INT (RND*A4/2)+1
)
9160 RETURN
```

THE WIZARD



THE WIZARD by M Gordon-Kerr of North Humberside is a text adventure for the 48K Spectrum. As usual in such games you must explore the various locations and use the objects you find to advance your quest, in this case with a view to killing the mad wizard of the west.

The program listing is in four parts. The first prints the instructions for the game. When you have typed it in, save it by typing GOTO 140. Then enter the second listing and save it with GOTO 9999.

The next two listings are data arrays. Type in the first and RUN. It will enter the data into an array and then SAVE itself; all you have to do is switch on the tape recorder when told to do so. The same procedure applies to the final listing. All you need to do is type LOAD "" to get the first program and the others will load automatically.

Listing 1

```
  10 REM INSTRUCTIONS
  20 CLS : OVER 1: PRINT "
   THE WIZARD";AT 0,0;"
 __________"
  30 PRINT "   The wizard is an
adventure   game of strategy and
 skill.The  object is to kill th
e mad WIZARDof the west.To do th
is you must have a blue potion."
  40 PRINT "   Other monsters ca
n be killed with other weapons w
hich you    will find lying arou
nd the      scenario.You must us
e the right weapon to kill the p
articular   monster you are figh
ting.Anotherwill not do."
  50 PRINT "   Your words of com
mand are:-"
  60 PRINT : PRINT """n"", to go
north"
  70 PRINT """e"" to go,east"
  80 PRINT """s"" to go south"
  90 PRINT """w"" to go west"
 100 PRINT """i"" to list your p
ossesions"
 110 PRINT """get ..."" to pick
something up"
 120 PRINT """use ..."" to fight
 a monster"
 130 LOAD "the wizard"
 139 STOP
 140 SAVE "THE WIZARD" LINE 10
```

Listing 2

```
   2 CLS : PRINT "Please wait":
LOAD "1" DATA l$(): LOAD "2" DAT
A p$()
   3 LET lc=1
   4 GO SUB 9000
  10 CLS
  20 PRINT "            THE WIZARD
"
  30 PRINT : PRINT "Location=";l
c;".You are"
  40 PRINT l$(lc)
  50 PRINT : FOR k=1 TO 30: IF l
(k)=lc THEN  GO TO 70
  60 NEXT k: GO TO 110
  70 IF t(k)=0 THEN  GO SUB 8000
  80 IF t(k)=1 THEN  GO SUB 8500
  90 LET k=k+1: IF k>30 THEN  GO
 TO 5000
  95 IF l(k)=l(k-1) THEN  GO TO
70
 100 GO TO 120
 110 PRINT "You have found nothi
ng"
 120 PRINT : PRINT "Directions:"
;
 130 IF n(lc)<>0 THEN  PRINT "No
rth,";
 140 IF e(lc)<>0 THEN  PRINT "Ea
st,";
 150 IF s(lc)<>0 THEN  PRINT "So
uth,";
 160 IF w(lc)<>0 THEN  PRINT "We
st,";
 170 PRINT
 180 IF lc=40 THEN  GO TO 5000
 181 INPUT a$
 182 IF a$="" THEN  GO TO 181
 185 IF a$(1)="i" THEN  GO TO 40
00
 190 IF a$="n" AND n(lc)<>0 THEN
  LET lc=n(lc): GO TO 10
 200 IF a$="e" AND e(lc)<>0 THEN
  LET lc=e(lc): GO TO 10
 210 IF a$="s" AND s(lc)<>0 THEN
  LET lc=s(lc): GO TO 10
 220 IF a$="w" AND w(lc)<>0 THEN
  LET lc=w(lc): GO TO 10
 230 GO TO 180
4000 CLS : PRINT "You are carryi
ng:-"
4010 PRINT : FOR k=1 TO 30: IF t
(k)=1 AND g(k)=1 THEN  PRINT p$(
k)
4020 NEXT k: PRINT AT 21,0;"PRES
S ANY KEY": PAUSE 0: CLS : GO TO
 120
5000 CLS : PRINT  FLASH 1;AT 0,1
0;"YOU HAVE WON!"
5010 PRINT : PRINT "You are now
a rich man,for you  have with yo
u:-"
5020 PRINT : FOR k=1 TO 30: IF t
(k)=1 AND g(k)=1 THEN  PRINT p$(
k)
5030 NEXT k: PRINT : PRINT TAB 1
0; FLASH 1;"WELL DONE!!!!"
5040 RESTORE 5060
5050 FOR k=1 TO 21: READ a,b: BE
EP a/2,b: NEXT k
5060 DATA 1,11,.5,11,.5,12,.5,12
,.5,11,.75,12,.25,11,.75,9,.25,7
,2,6,1,14,1,12,.25,11,.25,7,.25,
12,.25,9,.5,14,.5,12,1,11,1,9,4,
7
5070 STOP
8000 IF g(k)=1 THEN  RETURN
8010 PRINT p$(k);" attacks you"
8020 INPUT a$: IF LEN a$<5 THEN
 GO TO 8020
8025 IF a$( TO 3)<>"use" THEN  G
O TO 8070
8030 LET a$=a$(5 TO ): GO SUB 95
00: IF a$<>b$ THEN  GO TO 8070
8035 FOR j=1 TO 30: IF o$(j)=o$(
k) AND l(j)<>lc THEN  GO TO 8037
8036 NEXT j: GO TO 8070
8037 IF g(j)<>1 THEN  GO TO 8070
8040 PRINT "You have killed the
```

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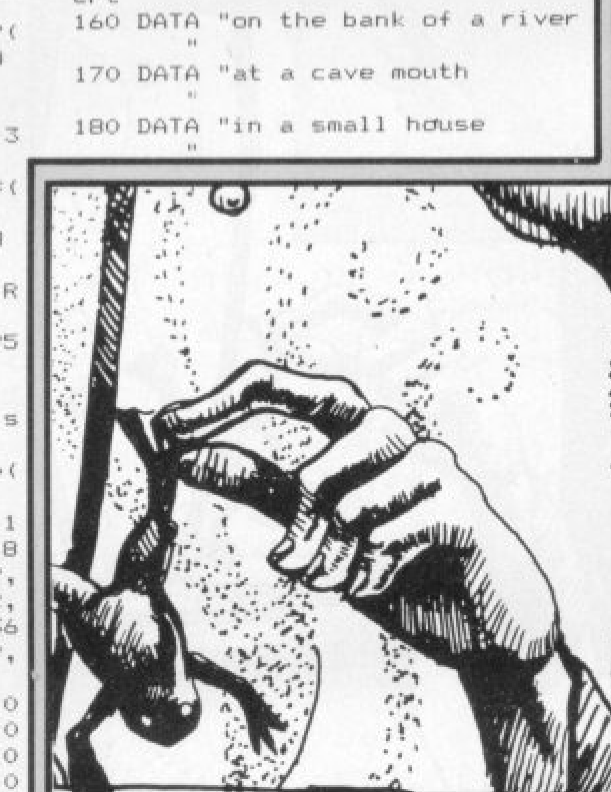
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```
monster": LET g(k)=1: FOR j=1 TO
 3: BEEP .5,10: BEEP .5,12: NEXT
 j: RETURN
8050 STOP
8070 CLS : PRINT "You have been
killed in battle  by ";p$(k)
8080 PRINT : PRINT  FLASH 1;AT 5
,12;"BAD LUCK!!!!"
8090 RESTORE 8100: FOR k=1 TO 11
: READ a,b: BEEP a/2,b: NEXT k
8100 DATA 1,7,.66,7,.33,7,1,7,.6
6,10,.33,9,.66,9,.33,7,.66,7,.33
,6,2,7
8110 PRINT AT 21,0;"Another go?(
y/n)": IF INKEY$="" THEN  GO TO
8110
8120 IF INKEY$="n" THEN  STOP
8130 IF INKEY$="y" THEN  GO TO 3
8500 IF g(k)=1 THEN  RETURN
8510 PRINT "You have found ";p$(
k)
8520 INPUT a$: IF LEN a$<5 THEN
 GO TO 8520
8525 IF a$( TO 3)<>"get" THEN  R
ETURN
8530 LET a$=a$(5 TO ): GO SUB 95
00: IF a$<>b$ THEN  RETURN
8550 LET g(k)=1: RETURN
9000 DIM n(40): DIM e(40): DIM s
(40): DIM w(40): RESTORE 9020
9010 FOR k=1 TO 40: READ n(k),e(
k),s(k),w(k): NEXT k
9020 DATA 3,4,5,2,15,1,0,0,0,0,1
,15,14,18,0,1,1,0,23,6,0,5,0,7,8
,6,21,0,9,0,7,0,10,0,8,0,0,11,9,
0,0,0,15,10,33,13,0,0,0,0,14,12,
13,17,4,0,11,3,2,0,0,35,0,0,0,36
,0,14,0,37,19,4,18,0,25,20,0,19,
0,0,7,22,26,0,0,0,0,21
9030 DATA 5,0,28,0,0,0,29,0,19,0
,30,0,21,27,0,0,0,0,0,26,23,29,0
,0,24,30,0,28,25,0,0,29,0,32,0,0
,0,33,0,31,0,34,12,32,0,0,0,33,0
,0,36,16,35,38,0,17,0,0,0,18,0,3
9,0,36,0,0,40,38,0,0,0,0
9040 DIM o$(30,8): FOR k=1 TO 30
: READ o$(k): NEXT k
9050 DATA "sword","water","brass
","dagger","sword","lance","crys
tal","sword","dagger","coins","d
agger","ore","lance","silver","p
otion","sword","water","bullion"
,"lance","sword","lance","sword"
9055 DATA "sword","wand","gold",
"sword","bars","wand","potion","
treasure"
9060 DIM g(30): FOR k=1 TO 30: L
ET g(k)=0: NEXT k
9070 DIM l(30): DIM t(30): FOR k
=1 TO 30: READ l(k),t(k): NEXT k
9080 DATA 1,1,3,0,3,1,4,0,9,0,11
,0,12,1,15,0,15,1,16,1,18,0,18,1
,20,0,20,1,21,1,22,0,22,1,24,1,2
5,0,27,0,27,1,31,0,35,0,35,1,35,
1,37,0,38,1,39,0,40,0,40,1
9090 RETURN
9500 LET b$="": FOR j=1 TO LEN o
$(k): IF o$(k,j)=" " THEN  RETUR
N
9510 LET b$=b$+o$(k,j): NEXT j:
RETURN
9998 STOP
9999 SAVE "the wizard" LINE 2
```

Listing 3

```
  5 DIM l$(40,28)
 10 REM WIZARD LOCATIONS
 20 FOR k=1 TO 40:READ l$(k):NEX
T k
 30 DATA "in the middle of a vas
t plain"
 40 DATA "by a barbed wire fence
    "
 50 DATA "in an old church
    "
 60 DATA "beside a river
    "
 70 DATA "at a cave entrance
    "
 80 DATA "in a smooth passage
    "
 90 DATA "at a t-junction
    "
100 DATA "in a dark damp passage
    "
110 DATA "in a large cavern
    "
120 DATA "at a bend in the passa
ge    "
130 DATA "by a sentry post
    "
140 DATA "at an oasis
    "
150 DATA "at the edge of the des
ert    "
160 DATA "on the bank of a river
    "
170 DATA "at a cave mouth
    "
180 DATA "in a small house
    "
190 DATA "on a dusty track
    "
200 DATA "on an island
    "
210 DATA "beside a lake
    "
220 DATA "in a castle
    "
230 DATA "in a chemist's shop
    "
240 DATA "in the goblin's dining
 room  "
250 DATA "on a rock plateau
    "
260 DATA "in the mint
    "
270 DATA "in a dark forest
    "
280 DATA "in the grocer's shop
    "
290 DATA "in the ironmonger's sh
op    "
300 DATA "in a rocky ravine
    "
310 DATA "at a t-junction
    "
320 DATA "at a bend in the road
    "
330 DATA "in a workman's cottage
    "
340 DATA "on a narrow path
    "
350 DATA "at the edge of the des
ert    "
360 DATA "at a dead end
    "
370 DATA "in a pirates' village
    "
380 DATA "at a t-junction
    "
390 DATA "in the orcs' kitchen
    "
400 DATA "on a golden road
    "
410 DATA "at a sentry post on th
e road "
420 DATA "in the treasure chambe
r    "
440 SAVE "1" DATA l$()
```





Listing 4

```
  5 DIM p$(30,15)
 10 REM WIZARD OBJECTS
 20 FOR k=1 TO 30:READ p$(k):NEX
T k
 30 DATA "a silver sword "
 40 DATA "a ghoul        "
 50 DATA "a brass goblet "
 60 DATA "a water-worm   "
 70 DATA "a cavernor     "
 80 DATA "a soligithud   "
 90 DATA "a red crystal  "
100 DATA "a caveguard    "
110 DATA "an iron dagger "
120 DATA "some coins     "
130 DATA "a swamp monster"
140 DATA "some metal ore "
150 DATA "a tyrant king  "
160 DATA "some silver    "
170 DATA "a blue potion  "
180 DATA "a goblin       "
190 DATA "some holy water"
200 DATA "some bullion   "
210 DATA "a forest giant "
220 DATA "a dwarf        "
230 DATA "a stout lance  "
240 DATA "a work-orc     "
250 DATA "a pirate       "
260 DATA "a magic wand   "
270 DATA "some gold      "
280 DATA "an orc         "
290 DATA "some gold bars "
300 DATA "a wizguard     "
310 DATA "the wizard     "
320 DATA "the treasure   "
330 SAVE "2" DATA p$()
```

GHOSTS

```
   2 LET sc=0: LET hsc=0: GO SUB
 9600: GO SUB 9800
   3 LET li=5: LET sc=0
   5 LET y=1: LET x=1
   6 BORDER 6: PAPER 6: CLS
   7 LET a=19: LET b=30: LET c=1
9: LET d=1
   8 LET d=1
  20 FOR n=0 TO 20
  25 PRINT AT n,0; INK 4;"(32*ig
8)"
  30 NEXT n
  35 FOR n=1 TO 19 STEP 2
  40 PRINT AT n,1; INK 6;"(31*sp
)"
  45 NEXT n
  48 PRINT AT 19,31; FLASH 1; IN
K 3;"(ig8)"
  49 PRINT AT y,x; INK 2;"M"
  50 PRINT AT 21,0; INVERSE 1;"H
ISCORE="; INVERSE 0;hsc;AT 21,12
; INVERSE 1;"SCORE="; INVERSE 0;
sc;AT 21,22; INVERSE 1;"LIVES=";
 INVERSE 0;li
  60 FOR n=2 TO 18 STEP 2: GO SU
B 75
  65 PRINT AT n,g; INK 6;"(sp)"
  70 NEXT n: GO TO 80
  75 LET g=INT (RND*10)+1: RETUR
N
  80 FOR n=2 TO 18 STEP 2: GO SU
B 95
  85 PRINT AT n,g; INK 6;"(sp)"
  90 NEXT n: GO TO 100
  95 LET g=INT (RND*10)+11: RETU
RN
 105 FOR n=2 TO 18 STEP 2: GO SU
B 120
 110 PRINT AT n,g; INK 6;"(sp)"
 115 NEXT n: GO TO 125
 120 LET g=INT (RND*10)+21: RETU
RN
 125 FOR n=1 TO 19 STEP 4: GO SU
B 140
 130 PRINT AT n,g; INK 4;"(ig8)"
 135 NEXT n: GO TO 145
 140 LET g=INT (RND*10)+11: RETU
RN
8020 IF INKEY$="5" AND ATTR (y,x
-1)<>52 THEN  PRINT AT y,x; INK
6;"(sp)": LET x=x-1: PRINT AT y,
x; INK 2;"M": BEEP .01,x
8030 IF INKEY$="8" AND ATTR (y,x
+1)<>52 THEN  PRINT AT y,x; INK
6;"(sp)": LET x=x+1: PRINT AT y,
x; INK 2;"M": BEEP .01,x
8040 IF INKEY$="6" AND ATTR (y+1
,x)<>52 THEN  PRINT AT y,x; INK
6;"(sp)": LET y=y+1: PRINT AT y,
x; INK 2;"M": BEEP .01,y
8050 IF INKEY$="7" AND ATTR (y-1
,x)<>52 THEN  PRINT AT y,x; INK
6;"(sp)": LET y=y-1: PRINT AT y,
x; INK 2;"M": BEEP .01,y
8060 IF y=19 AND x=31 THEN  GO S
UB 9100
8100 PRINT AT a,b; INK 3;"G"
8101 PRINT AT c,d; INK 3;"G"
8120 IF a<y AND ATTR (a+1,b)<>52
 THEN  PRINT AT a,b; INK 6;"(sp)
": LET a=a+1: PRINT AT a,b; INK
3;"G": BEEP .01,a
8121 IF c<y AND ATTR (c+1,d)<>52
 THEN  PRINT AT c,d; INK 6;"(sp)
": LET c=c+1: PRINT AT c,d; INK
3;"G": BEEP .01,c
8130 IF a>y AND ATTR (a-1,b)<>52
 THEN  PRINT AT a,b; INK 6;"(sp)
": LET a=a-1: PRINT AT a,b; INK
3;"G": BEEP .01,a
```

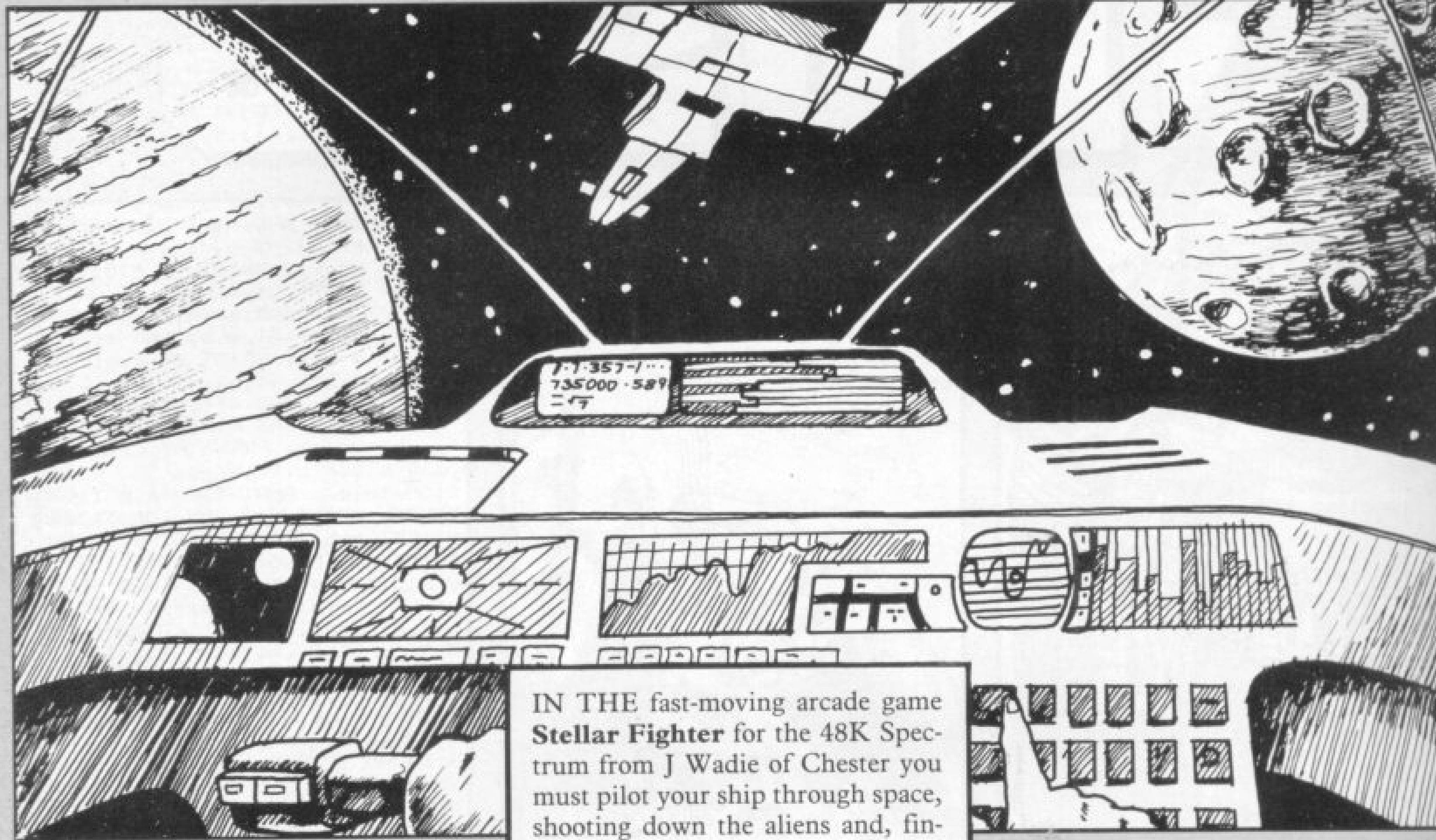


G HOSTS for the 16K Spectrum by P A Charter of Salisbury, Wiltshire is an arcade game which requires a little logical thought to win. You,have to negotiate a maze while avoiding two ghosts who will attempt to block you from the exit. When you have typed-in the program, save it by using GOTO 9990 and the program will then auto-run when it has been loaded from tape.

This program uses special graphics characters, explained on page 67.

```
8131 IF c>y AND ATTR (c-1,d)<>52
 THEN  PRINT AT c,d; INK 6;"(sp)
": LET c=c-1: PRINT AT c,d; INK
3;"G": BEEP .01,c
8140 IF b<x AND ATTR (a,b+1)<>52
 THEN  PRINT AT a,b; INK 6;"(sp)
": LET b=b+1: PRINT AT a,b; INK
3;"G": BEEP .01,b
8141 IF d<x AND ATTR (c,d+1)<>52
 THEN  PRINT AT c,d; INK 6;"(sp)
": LET d=d+1: PRINT AT c,d; INK
3;"G": BEEP .01,d
8150 IF b>x AND ATTR (a,b-1)<>52
 THEN  PRINT AT a,b; INK 6;"(sp)
": LET b=b-1: PRINT AT a,b; INK
3;"G": BEEP .01,b
8151 IF d>x AND ATTR (c,d-1)<>52
 THEN  PRINT AT c,d; INK 6;"(sp)
": LET d=d-1: PRINT AT c,d; INK
3;"G": BEEP .01,d
8153 IF a=c AND b=d THEN  LET a=
19: LET b=30
8155 IF a=y AND b=x OR c=y AND d
=x THEN  GO TO 9000
8160 GO TO 8000
9000 FOR n=0 TO 20: BEEP .01,n:
NEXT n: FOR n=20 TO 0 STEP -1: B
EEP .01,n: NEXT n: LET li=li-1:
CLS
9001 IF li=0 THEN  GO TO 9500
9002 GO TO 5
9100 LET sc=sc+10: FOR n=-20 TO
20: BEEP .05,n: NEXT n: FOR n=20
 TO -20 STEP -1: BEEP .05,n: NEX
T n: CLS : GO TO 5
9500 PRINT AT 10,3; FLASH 1;"YOU
 HAVE RUN OUT OF LIVES": FOR n=1
 TO 500: NEXT n: CLS : GO TO 990
0
9600 FOR f=0 TO 7: READ t: POKE
USR "M"+f,t: NEXT f
9605 FOR f=0 TO 7: READ t: POKE
USR "G"+f,t: NEXT f
9610 RETURN
9700 DATA 62,42,62,8,28,54,99,99
,56,124,84,124,198,254,170,0
9800 PRINT AT 5,10; FLASH 1;"MAZ
E CHASE";AT 15,10; FLASH 0;"P.A.
CHARTER.";AT 17,11;"Salisbury":
FOR n=1 TO 700: NEXT n: CLS
9810 PRINT AT 1,10;"INSTRUCTIONS
";AT 1,10; OVER 1;"____________"
;AT 5,0;"THE OBJECT OF THE GAME
IS TO    GUIDE THE MAN (M) TO TH
E FAR    CORNER OF THE MAZE (";
FLASH 1;"(ig8)"; FLASH 0;") USIN
G THECURSOR KEYS. SOUNDS EASY??.
.THE PROBLEM IS THAT YOU ARE CHA
SED  BY TWO GHOSTS (G G)";AT 17,
11;"GOOD LUCK";AT 20,5;"PRESS AN
Y KEY TO START"
9811 PAUSE 0
9812 RETURN
9900 IF sc>hsc THEN  LET hsc=sc:
 PRINT AT 3,0;"CONGRATULATONS YO
U ARE TODAYS   HISCORER PLEASE E
NTER YOUR NAME MAXIMUM 20 LETERS
": INPUT A$: CLS
9901 PRINT AT 3,2;"HIGH SCORE=";
hsc;AT 7,2;"SCORE=";sc;AT 11,2;"
HISCORER=";A$;AT 14,0;"DO YOU WI
SH TO PLAY AGAIN (Y/N)"
9902 IF INKEY$="Y" OR INKEY$="y"
 THEN  GO TO 3
9903 IF INKEY$="N" OR INKEY$="n"
 THEN  PRINT USR 0
9904 IF INKEY$<>"Y" OR INKEY$<>"
N" OR INKEY$<>"y" OR INKEY$<>"n"
 THEN  GO TO 9901
9990 SAVE "VGHOST" LINE 1
```

STELLAR FIGHTER



IN THE fast-moving arcade game **Stellar Fighter** for the 48K Spectrum from J Wadie of Chester you must pilot your ship through space, shooting down the aliens and, finally, perform a docking manoeuvre.

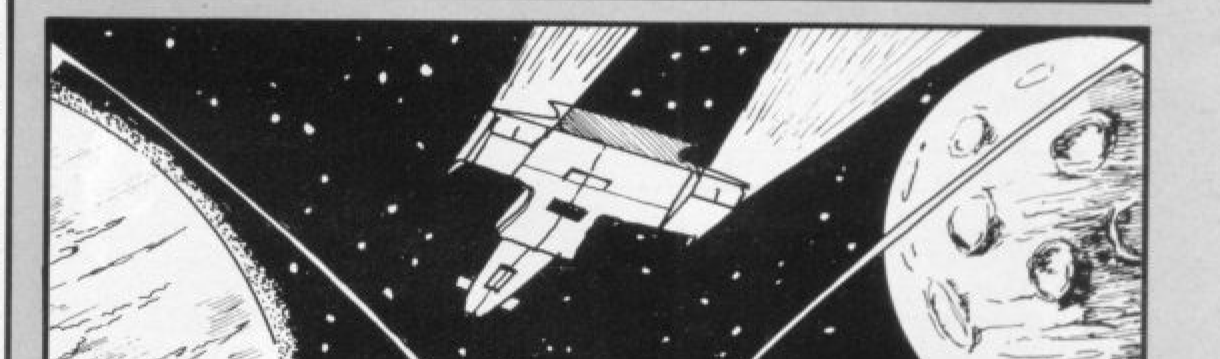
The screen shows the view from your cockpit and the status indicators display damage, Phasor levels and information describing your enemy. Full instructions are included in the program.

Graphics instructions are given in detail on page 67.

```
   1 BORDER 0: PAPER 6: INK 0: C
LS : GO SUB 9500: GO TO 2
   2 PAPER 7: INK 1: BORDER 1: C
LS : PRINT AT 3,8;"STELLAR FIGHT
ER";AT 4,8;"(15*ig3)": STOP
   3 PRINT  INK 2;AT 7,8;"COCKPI
T*CONTROLS"; INK 0;AT 9,11;"5 =
LEFT";AT 11,11;"8 = RIGHT";AT 13
,11;"6 = DIVE";AT 15,11;"7 = CLI
MB"
   4 PRINT  INK 0;AT 17,11;"1 =
DOCK";AT 19,11;"0 = FIRE"
   5 RESTORE 6: FOR n=1 TO 19: R
EAD c,d: BEEP c,d: NEXT n: PAUSE
 500
   6 DATA .15,7,.15,7,.15,7,.9,0
,.9,7,.15,5,.15,4,.15,2,.9,12,.4
5,7,.15,5,.15,4,.15,2,.9,12,.45,
7,.15,5,.15,4,.15,5,1,2
   7 BORDER 0: PAPER 1: INK 7: C
LS
  14 PRINT AT 5,14;"WE";AT 7,13;
"HAVE";AT 9,11;"LIFT-OFF"
  15 FOR g=1 TO 20: FOR f=0 TO 7
: BORDER f: BEEP .02,f: NEXT f:
NEXT g
  18 GO SUB 8000
  19 INK 5: PAPER 0: BORDER 0: C
LS
  20 PLOT 0,40: DRAW 70,0: DRAW
20,-20: DRAW 75,0: DRAW 20,20: D
RAW 70,0
  21 PLOT 2,38: DRAW 68,0: DRAW
20,-20: DRAW 75,0: DRAW 20,20: D
RAW 68,0
  22 PLOT 2,38: DRAW 0,-36: DRAW
 251,0: DRAW 0,36: PLOT 90,18: D
RAW 0,-16: PLOT 165,18: DRAW 0,-
16
  25 PRINT  INK 7;AT 18,23;"ACD:
";AT 20,23;"CI:";AT 18,1;"DAM%:"
  26 PRINT  INK 7;AT 20,1;"PHE:"
;AT 20,12;"CODE "
 590 LET dock=0: LET gog=INT (RN
D*26)+27: LET ran=INT (RND*13)+1
3: LET rf=0: LET c=0: LET sc=0:
LET ra=INT (RND*8)+4: LET acd=0
 591 LET fo=10: LET for=20: LET
fort=30
 598 LET ph=1000: LET dam=0
 599 PRINT  INK 5;AT 20,17;"(2*g
8)"
 600 LET da=INT (RND*30)+15
 610 LET d=INT (RND*14): LET a=I
NT (RND*27)
 620 LET r1=INT (RND+.5): IF r1=
0 AND d>4 THEN  LET d=d-1: IF r1
=1 AND d<17 THEN  LET d=d+1
 630 LET r2=INT (RND+.5): IF r2=
0 AND a>2 THEN  LET a=a-1: IF r2
=1 AND a<16 THEN  LET a=a+1
 641 IF INKEY$="8" AND a<17 THEN
  LET a=a+3
 642 IF INKEY$="7" AND d>3 THEN
 LET d=d-3
 643 IF INKEY$="6" AND d<13 THEN
  LET d=d+3
 644 IF INKEY$="5" AND a>2 THEN
 LET a=a-3
 645 IF INKEY$="1" THEN  GO TO 8
500
 647 IF INKEY$=" " THEN  GO TO 9
998
 649 LET c=c+1: IF c>=fo THEN  G
O TO 652: IF c>=for THEN  GO TO
651
 650 PRINT  INK 6;AT d,a;a$: GO
TO 654
 651 PRINT AT d,a;b$: GO TO 655
 652 PRINT  INK 6;AT d,a;c$
 655 IF INKEY$="0" THEN  LET ph=
ph-10: PRINT  INK 7;AT 20,5;ph:
GO TO 6000
 700 FOR b=-20 TO -15: BEEP .005
,b: NEXT b
 800 LET rf=rf+1
 801 PRINT  INK 6;AT 20,26;c$
 805 PRINT  INK 7;AT 9,16;"!";AT
 11,16;"!";AT 10,15;"-";AT 10,17
;"-"
 810 IF rf<fort THEN  GO TO 900
 812 FOR x=4 TO 0 STEP -4
 813 PLOT a*8+10,175-d*8: DRAW
INK x;40,-36
 814 FOR l=0 TO 10: BEEP .05,3:
NEXT l: BEEP .05,10: BEEP .05,12
 815 NEXT x
 816 FOR x=7 TO 0 STEP -1: BEEP
.005,INT (RND*10): BORDER x: NEX
T x
 819 LET rf=0: LET c=0: LET dam=
dam
 820 LET dam=dam+da: PRINT  INK
7;AT 18,6;dam
 825 IF dam>60 AND dam<100 THEN
 GO TO 9300
 830 IF dam>=99 THEN  GO TO 9400
 840 PRINT AT d,a;"    ": GO TO 6
00
 900 PRINT AT d,a;"    "
1000 GO TO 620
5000 REM firing laser
6000 REM shoot
6001 IF ph<100 AND ph>0 THEN  PR
INT AT 20,7;" "
6010 IF ph<=-100 THEN  GO TO 930
0
6105 FOR n=3 TO 0 STEP -3
6110 PLOT  INK 0;7,48: DRAW  INK
 n;119,41
6120 PLOT  INK 0;248,48: DRAW  I
NK n;-110,40
6125 NEXT n
6127 FOR q=1 TO 10: BEEP .01,1+f
: BEEP .01,10: NEXT q
6130 IF ATTR (10,16)=6 THEN  GO
TO 6134
6133 GO TO 656
6134 GO SUB 7000
6135 LET acd=acd+1: LET sc=sc+1:
 LET rf=0: PRINT  INK 7;AT 18,27
```

```
;acd
6136 IF sc=43 THEN  GO TO 9600
6139 LET c=0: IF sc=ra THEN  GO
SUB 8015
6140 IF sc=ran THEN  GO SUB 8025
6141 IF sc=gog THEN  GO SUB 8035
6143 GO.TO 600
7000 LET z$="E"
7010 FOR n=6 TO 0 STEP -6
7011 LET cox=0
7015 PRINT  INK n; BRIGHT 1;AT 1
0,15;z$
7020 FOR p=1 TO 4
7030 PRINT  INK n;AT 10+p,15+p;z
$;AT 10-p,15-p;z$;AT 10+p,15-p;z
$;AT 10-p,15+p;z$;AT 10,15+p;z$;
AT 10,15-p;z$;AT 10+p,15;z$;AT 1
0-p,15;z$
7035 BEEP .0025,INT (RND*20)
7040 NEXT p: NEXT n
7041 LET cox=cox+1
7042 IF cox=2 THEN  GO TO 7045
7043 FOR n=3 TO 0 STEP -3
7044 GO TO 7015
7045 BRIGHT 0: RETURN
8000 FOR f=0 TO 4: FOR g=0 TO 7:
 READ a: POKE USR CHR$ (144+f)+g
,a: NEXT g: NEXT f
8001 LET a$="(sp,A,sp)": LET c$=
"BCD"
8005 DATA 0,0,36,195,255,219,0,0
8006 DATA 96,241,250,252,255,255
,241,96
8007 DATA 129,24,60,126,255,255,
255,90
8008 DATA 6,143,95,63,255,255,14
3,6
8009 DATA BIN 01000000,0,BIN 011
00010,BIN 00100001,0,BIN 0001100
0,1,BIN 10000101
8010 RETURN
8015 RESTORE 8020: FOR f=0 TO 3:
 FOR g=0 TO 7: READ a: POKE USR
CHR$ (149+f)+g,a: NEXT g: NEXT f
8016 LET a$="sp,F,sp": LET c$="g
GHI"
8020 DATA 0,129,66,60,60,66,129,
0
8021 DATA 192,48,12,3,3,12,48,19
2
8022 DATA 0,126,195,231,255,126,
0,0
8023 DATA 3,12,48,192,192,48,12,
3
8024 RETURN
8025 RESTORE 8027: FOR f=0 TO 3:
 FOR g=0 TO 7: READ a: POKE USR
CHR$ (153+f)+g,a: NEXT g: NEXT f
8026 LET a$="sp,J,sp": LET c$="K
LM"
8027 DATA 0,0,126,219,255,126,0,
0
8028 DATA 3,15,62,252,63,15,3,0
8029 DATA 255,255,126,60,255,255
,255,165
8030 DATA 192,240,124,63,252,240
,192,0
8031 RETURN
8035 RESTORE 8037: FOR f=0 TO 3:
 FOR g=0 TO 7: READ a: POKE USR
CHR$ (157+f)+g,a: NEXT g: NEXT f
8036 LET a$="sp,N,sp": LET c$="O
PQ"
8037 DATA 0,66,153,255,153,66,0,
0
8038 DATA 96,64,193,255,255,193,
64,96
8039 DATA 0,255,231,219,219,231,
255,0
8040 DATA 6,2,131,255,255,131,2,
6
8041 RETURN
8045 RESTORE 8047: FOR f=0 TO 3:
 FOR g=0 TO 7: READ a: POKE USR
CHR$ (161+f)+g,a: NEXT g: NEXT f

8046 LET a$="sp,R,sp": LET c$="S
TU"
8047 DATA 0,0,219,255,255,219,0,
0
8048 DATA 0,112,250,142,255,254,
250,112
8050 DATA 0,24,60,126,195,126,60
,24
8051 DATA 0,14,95,113,255,127,95
,14
8052 RETURN
8500 IF ATTR (20,17)=5 THEN  GO
TO 610: GO TO 8501
8501 GO SUB 8045: GO TO 8502
8502 LET dock=dock+1
8503 IF dock>=4 THEN  GO SUB 803
5: GO TO 610
8506 PRINT  INK 6; FLASH 1;AT 20
,12;"DOCKING"
8507 LET cp=1
8508 PRINT  BRIGHT 1; INK 4;AT 1
0,cp;c$
8509 LET cp=cp+1
8510 IF cp=16 THEN  GO TO 8590
8511 PAUSE 25
8512 PRINT AT 10,cp-1;" "
8513 GO TO 8508
8591 FOR n=7 TO 0 STEP -7
8592 PLOT  INK 0;248,48: DRAW  I
NK n;-110,40
8593 PLOT  INK 0;7,48: DRAW  INK
 n;119,40
8594 BEEP 1,-10: BEEP 1,10: BEEP
 1,-10
8595 NEXT n
8599 PRINT AT 10,14;"(7*space)"
8600 PRINT  INK 5;AT 20,17;"(2*g
8)"; INK 7;AT 20,12;"CODE "
8605 PRINT AT 18,6;"   "
8606 PRINT AT 20,5;"    "
8610 GO SUB 8001
8650 GO TO 598
9300 PRINT  INK 2;AT 20,17;"(2*g
8)"
9350 GO TO 700
9400 PRINT AT d,a;"(3*space)": B
ORDER 0
9401 FOR g=1 TO 3: FOR f=0 TO 7:
 BORDER f: BEEP .05,f+g-1: NEXT
f: NEXT g
9405 BORDER 0: PAPER 7: INK 1: C
LS
9410 PRINT AT 7,10;"S O  T H I S
";AT 9,10;"M U S T  B E";AT 11,1
0;"H E A V E N"
9411 PRINT TAB 10;"(11*g3)"
9412 PRINT  INK 0;AT 15,15;"(2*g
8)";AT 16,15;"(2*g8)";AT 17,13;"
(6*g8)";AT 18,15;"(2*g8)";AT 19,
15;"(2*g8)";AT 20,15;"(2*g8)";AT
 21,14;"(ig6,2*g8,g6)": PRINT  O
VER 1;AT 21,14;"(ig2,2*sp,ig1)"
9420 RESTORE 9425: FOR n=0 TO 35
: READ c,d: BEEP c,d: NEXT n
9425 DATA 1,0,1,2,.5,3,.5,2,1,0,
1,0,1,2,.5,3,.5,2,1,0,1,3,1,5,2,
7,1,3,1,5,2,7,.75,7,.25,8,.5,7,.
5,5,.5,3,.5,2,1,0,.75,7,.25,8,.5
,7,.5,5,.5,3,.5,2,1,0,1,0,1,-5,2
,0,1,0,1,-5,2,0
9426 CLS : PRINT "O.K Trainee do
you want another  attempt at sta
ying alive ?      Push 'n' to ne
w program or 'y'  to run again"
9427 PAUSE 0: IF INKEY$="n" THEN
 NEW : GO TO 9428
9428 PRINT  FLASH 1;AT 16,11;"BR
AVE LAD"
9429 FOR f=1 TO 30: LET rs=INT (
RND*50): BEEP .05,rs: NEXT f
9430 PAUSE 100: CLS : RUN
9500 LET i$="THIS IS BASE CALLIN
G FIGHTER....Your mission is to
escort a      convoy of craft acr
oss the       galaxy. It is unlik
ely that you will survive though
.You may dock for repairs only 3
 times.      "
9505 LET i$=i$+"(11*sp)READ-OUTS
(14*sp)DAM%=damage(28*sp)PHE =ph
asor energy(15*sp)ACD =alien cra
ft destroyed(6*sp)CI(3*sp)=craft
 identity(50*sp)THIS IS BASE OVE
R AND OUT"
9510 PRINT "(9*sp)RADIO MESSAGE(
10*sp)"
9511 PRINT "(9*sp)+++++ +++++++(
10*sp)"
9520 FOR b=1 TO LEN i$: BEEP .00
5,5: PRINT i$(b);: NEXT b
9530 PAUSE 0: RETURN
9600 PRINT AT d,a;"(4*sp)"
9601 PRINT  FLASH 1;AT 0,0;"(7*s
p)MISSION COMPLETE(8*sp)": PAUSE
 300
9605 LET sc=0: LET dam=0: LET ph
=1000: LET dock=0: LET fo=fo-5:
LET for=for-5: LET fort=fort-5
9610 PAUSE 100: PRINT  FLASH 0;A
T 0,0;"(32*sp)"
9611 IF for<2 THEN  LET for=2: I
F fo<3 THEN  LET fo=3: IF fort<4
 THEN  LET fort=4
9615 PRINT AT 0,0;"(4*sp)RETURN
HOME TO FLY AGAIN"
9616 PAUSE 200: PRINT AT 0,0;"32
*sp)"
9620 PRINT AT 18,6;"(3*sp)";AT 2
0,5;"(4*sp)"
9630 FOR f=1 TO 30: BEEP .05,20:
 BEEP .05,0: NEXT f
9640 GO SUB 8001: GO TO 598
9998 PRINT  FLASH 1;AT 0,0;"(8*s
p)MISSION ABORTED(8*sp)": PAUSE
50
9999 PAUSE 50: RUN
```





DARK FOREST

THIS MONTH's Cambridge Awards program is from 14-year-old David Batey of Bedlington, Northumberland and should provide some light relief from the fiendish complexity of the previous two games in the series. In **Dark Forest** you may be called on to meet Dracula, battle a werewolf, or play Russian roulette with poisoned cocktails. A rather unlikely knight in shining armour awaits to rescue you and the program will appeal particularly to some of our younger readers.

The program is in two sections. The first is the main program, and the second contains user-defined graphics data. Enter the first listing and save it using the instruction SAVE "DF" LINE 9999. Then enter the second listing, and RUN it. When you have done this, save it with SAVE "gr" CODE USR "a", 21*8. The program runs on a 16K Spectrum but if you have a 48K machine you could combine both programs easily.

Graphics instructions are explained in detail on the first page of Program Printout, page 67.

Listing 1

```
   5 POKE 23658,0
 160 BORDER 7: PAPER 7: INK 0: B
RIGHT 0: OVER 0: INVERSE 0: FLAS
H 0: CLS
 170 PRINT "(2*sp)YOU ARE LOST I
N A FOREST AND(5*sp)IT IS APPROA
CHING MIDNIGHT."
 180 PRINT ''" YOU ARE STANDING
ON THE BANK(12*sp)OF A STREAM."
 190 PRINT ''''"(2*sp)DO YOU WAN
T TO GO UP-STREAM(11*sp)OR DOWN-
STREAM ?"
 200 PRINT 'TAB (9);"( up or dow
n )"
 210 INPUT a$
 220 IF a$<>"up" AND a$<>"down"
THEN  GO TO 210
 230 LET a=INT (RND*2)
 240 IF a=1 THEN  GO TO 500: IF
a=0 THEN  GO TO 250
 250 BORDER 0: PAPER 0: INK 6: C
LS
 300 PLOT 0,120: DRAW 245,0: PLO
T 0,120: DRAW 0,30: GO SUB 499
 301 DRAW 0,-20: GO SUB 499: DRA
W 0,30: GO SUB 499
 302 DRAW 0,-10: GO SUB 499: DRA
W 0,10: GO SUB 499
 303 DRAW 0,-30: GO SUB 499: DRA
W 0,20: GO SUB 499: DRAW 0,-30
 304 PLOT 115,120: DRAW 0,10: DR
AW 20,0,-PI: DRAW 0,-10
 305 BRIGHT 1: INK 7: FOR f=15 T
O 230 STEP 70: PLOT f,130: DRAW
5,0: DRAW 0,7: DRAW -5,0,PI: DRA
W 0,-7: NEXT f: INK 6: BRIGHT 0
 310 PLOT 120,139: FOR a=139 TO
120 STEP -1: PLOT 120,a: PLOT 12
5,a: PLOT 130,a: BEEP .01,a-100:
 NEXT a
 320 PRINT AT 8,9;"W E L C O M E
";AT 10,14;"T O"
 321 PRINT AT 12,13;"T H E";AT 1
4,4;"R E S I D E N C E   O F"
 324 INK 7
 325 PRINT AT 18,0;"(sp*2,ig4,g3
,g6,sp,ig4,g3,g7,sp,ig4,g3,g7,sp
,ig4,g3,g7,sp,ig5,sp,g5,ig5,3*sp
,ig4,g3,g7,2*sp)"
 330 PRINT "(2*sp,ig5,sp,g5,sp,i
g1,ig3,ig2,sp,ig1,ig3,ig2,spnig5
,3*sp,ig5,sp,g5,sp,ig5,3*sp,ig1,
ig3,ig2,2*sp)"
 335 PRINT "(2*sp,ig1,ig3,ig6,sp
,ig5,sp,ig5,sp,ig5,sp,g5,sp,ig1,
ig3,ig2,sp,ig1,ig3,ig2,sp,ig1,ig
3,ig3,sp,ig5,sp,g5,2*sp)"
 340 FOR g=1 TO 30: INK INT (RND
*5+1): OVER 1: FOR n=18 TO 21: P
RINT AT n,0,,: NEXT n: OVER 0: N
EXT g
 350 BORDER 7: PAPER 7: INK 0: C
LS
 351 PRINT "Do you wish to proce
ed into the castle or are you a
"; FLASH 1;"SCAREDY BAT"; FLASH
0;"?"
 352 PRINT '''" Press 'e' to ent
er the castle "''"(3*sp)or(2*sp)
's' to scram !"
 353 INPUT a$
 354 IF a$<>"e" AND a$<>"s" THEN
  GO TO 353
 355 IF a$="s" THEN  GO TO 1000
 356 LET w=INT (RND*2): IF w=1 T
HEN GO TO 999
 357 CLS : PLOT 0,31: DRAW 255,0
 358 FOR f=0 TO 16
 359 PRINT AT f,f;"CD"
 360 BEEP .15,50
 361 PRINT AT f,f;"EF"
 362 FOR x=1 TO 15: NEXT x
 363 PRINT AT f,f;"(2*sp)"
 364 NEXT f
 365 FOR a=1 TO 10: LET i=RND*5:
 PRINT AT 16,16; INK i;"GH";AT 1
7,16; INK i;"IJ": FOR x=1 TO 10:
 PRINT AT 16,16;"(2*sp)";AT 17,1
6;"(2*sp)": NEXT a
 366 PRINT AT 16,16;"A";AT 17,16
;"B"
 367 PRINT AT 19,5;"My name is C
ount Dracula"
 368 BEEP .5,-30: BEEP 1,-10: BE
EP .25,-20: BEEP .25,-10: BEEP .
25,0: BEEP 1,-10
 370 BORDER 2: INK 7: CLS : FOR
m=1 TO 704: PRINT  INK 2;"(ig8)"
;: NEXT m: PAPER 2
 371 PRINT AT 5,8; PAPER 1; FLAS
```



```
H 1;"YOU ARE UNLUCKY"
 372 PRINT AT 8,0;"Dracula has d
runk your blood andyou will be a
 vampire until the end of the wo
rld ! ! !"
 373 FOR x=1 TO 200: NEXT x
 374 PRINT AT 13,0;"Your only ch
ance is to go back(8*sp)to the b
eginning."
 375 FOR x=1 TO 700: NEXT x
 376 GO TO 8000
 499 FOR f=1 TO 3: DRAW 0,5: DRA
W 5,0: DRAW 0,-5: DRAW 5,0: NEXT
 f: DRAW 0,5: DRAW 5,0: DRAW 0,-
5: RETURN
 500 BORDER 7: PAPER 7: INK 0: C
LS
 515 PRINT "You have found a bla
ck stallion and are galloping aw
ay on it."
 520 FOR a=1 TO 5
 525 FOR f=15 TO 17: BEEP .003,1
0: PAUSE 6-f/5: BEEP .003,5: PAU
SE 6-f/5: BEEP .003,0: PAUSE 5-f
/5: BEEP .003,1: PAUSE 25-f: NEX
T f
 526 NEXT a
 530 CLS : PRINT AT 9,0;"You see
 a cross-bow lying on the(6*sp)g
round.Do you want(15*sp)to pick
it up ?"
 531 PRINT 'TAB 8;"( yes or no )
"
 532 INPUT c$: IF c$<>"yes" AND
c$<>"no" THEN  GO TO 532
 533 IF c$="yes" THEN  LET c=1
 534 IF c$="no" THEN  LET c=0
 535 LET r=INT (RND*3): IF r=2 T
HEN  GO TO 250
 536 BORDER 1: PAPER 1: INK 7: C
LS
 537 PRINT "You have ventured do
wn a dark(3*sp)alleyway only to
find a werewolfstanding at the o
ther end."
 540 IF c=0 THEN  PAUSE 100: PRI
NT ''"If you had picked the cros
s-bow you might have stood a cha
nce(3*sp)against it !!": FOR f=1
 TO 400: NEXT f: GO TO 8000
 545 LET q=INT (RND*26)+65: PRIN
T ' "When a letter appears on th
e(4*sp)screen press the correspo
nding(2*sp)key on your computer
to try and shoot the werewolf."
 550 FOR f=1 TO 1000: NEXT f: CL
S
 551 BEEP .5,10
 555 PRINT AT 10,15;CHR$ q
 556 POKE 23658,8
 560 FOR w=1 TO 1000000: IF INKE
Y$<>CHR$ q THEN  NEXT w
 561 POKE 23658,0
 565 IF w<70 THEN  PRINT AT 15,5
; FLASH 1;"YOU SHOT THE WEREWOLF
": GO TO 575
 570 IF w>70 THEN  PRINT AT 15,0
; FLASH 1;"YOU WERE TOO SLOW!(2*
sp)THE WEREWOLF": PRINT  PAPER 2
; INK 7; FLASH 1;"(4*sp)HAS CLAW
ED YOU TO DEATH(5*sp)"
 571 FOR f=1 TO 400: NEXT f: GO
TO 8000
 575 FOR f=1 TO 200: NEXT f: GO
TO 1000
 800 BORDER 1: PAPER 1: INK 7: C
LS
 999 CLS : PRINT AT 9,0; FLASH 1
;"YOU WERE LUCKY - YOU GOT THROU
GH(7*sp)THE CASTLE SAFELY(8*sp)"
: FOR x=1 TO 400: NEXT x
 1000 LET r=INT (RND*2)
 1002 IF r=1 THEN  GO TO 1100
 1004 BORDER 4: PAPER 4: INK 0: C
LS
 1006 PRINT "You are walking alon
g a cliff": FOR x=1 TO 100: NEXT
 x: PRINT ''"You trip over a sti
ck and......"
 1007 FOR x=1 TO 200: NEXT x
 1008 BORDER 5: PAPER 5: INK 0: C
LS
 1010 PRINT AT 6,0; INK 4; PAPER
7; INVERSE 1;"KKKKKKKKKK": FOR x
=7 TO 21: PRINT AT x,0; INK 7;"(
10*ig8)": NEXT x
 1012 PRINT AT 20,10; INK 1;"KKKK
KKKKKKKKKKKKKKKKKK";AT 21,0; INK
 1;"(32*ig8)"
 1014 PRINT AT 20,0; PAPER 7; INK
 1;"KKKKKKKKKK"
 1016 LET l=13: FOR f=6 TO 19: PR
INT AT f,10;"L": BEEP .05,l-1: P
RINT AT f,10;"M": BEEP .05,l: LE
T l=l-1: PRINT AT f,10;"(sp)": N
EXT f
 1017 INK 1: OVER 1: FOR f=1 TO 1
0: BEEP .01,RND*10: PRINT AT 20,
10;"\": PAUSE 5: PRINT AT 20,10;
"|": PAUSE 5: PRINT AT 20,10;"/"
: PAUSE 5: NEXT f: OVER 0
 1018 FOR x=1 TO 200: NEXT x
 1020 BORDER 7: PAPER 7: INK 0: C
LS
 1022 PRINT AT 10,0; INK 2; FLASH
 1;"YOU HAVE DROWNED IN THE DEEP
 SEA"
 1024 FOR x=1 TO 300: NEXT x: GO
TO 8000
 1100 BORDER 1: PAPER 1: INK 7: C
LS
 1105 LET r=INT (RND*6)
 1110 IF r=0 OR r=1 OR r=2 THEN
GO TO 2000
 1115 IF r=3 OR r=4 THEN  GO TO 3
000
 1120 IF r=5 THEN  GO TO 4000
 2000 BORDER 5: PAPER 5: INK 0: C
LS
 2005 PLOT 0,87: DRAW 255,0: PLOT
 0,67: DRAW 10,10: DRAW 235,0: D
RAW 10,-10
 2010 PRINT AT 10,3; INK 1;"I";AT
 10,15; INK 2;"I";AT 10,28; INK
0;"I"
 2015 PRINT AT 8,3;"0";AT 8,15;"1
";AT 8,28;"2"
 2020 PRINT AT 17,0;"One of the g
oblets of wine on(3*sp)the table
 is poisoned.(10*sp)Which one do
 you want to drink ?"
 2025 LET p=INT (RND*3)+48
 2030 PRINT AT 21,0;"( Press eith
er 0 , 1 or 2 )"
 2035 IF INKEY$<>"0" AND INKEY$<>
"1" AND INKEY$<>"2" THEN  GO TO
2030
 2040 IF INKEY$=CHR$ p THEN  BORD
ER 0: PAPER 0: INK 7: CLS : FOR
x=1 TO 50: BEEP .005,RND*x: NEXT
 x: PRINT  PAPER 4; INK 0; FLASH
 1;AT 10,0;"YOU HAVE DRUNK THE P
OISON !!": FOR f=1 TO 400: NEXT
f: GO TO 8000
 2045 BORDER 7: PAPER 7: INK 0: C
LS
 2050 PRINT  FLASH 1; PAPER 6;TAB
 3;"YOU HAVE NOT DRUNK THE POISO
N"
 2055 PRINT ''"(4*sp)YOU ARE SAFE
```

continued on page 78



continued from page 77

```
 AND WELL "
2060 BEEP 1,20: BEEP 1,30: BEEP
1,40
2065 GO TO 500
3000 BORDER 0: PAPER 0: INK 7: C
LS
3005 PRINT "YOU HAVE GONE ROUND
IN A CIRCLE!"
3010 PRINT : FOR f=1 TO 200: NEX
T f: GO TO 170
4000 BORDER 7: PAPER 7: INK 0: C
LS
4005 PRINT "AFTER THIS LONG AND
EXCITING(4*sp)ADVENTURE AN AMAZI
NG MIRACLE HASOCCURED ! CLIVE SI
NCLAIR YOUR(3*sp)FAITHFUL FRIEND
,WITHOUT WHOM(4*sp)THIS ADVENTUR
E WOULD NOT HAVE(3*sp)BEEN POSSI
BLE,HAS . . . . . . . "
4006 PRINT  PAPER 1; INK 7; FLAS
H 1;" RESCUED YOU FROM IMMINENT
DOOM "
4010 FOR f=1 TO 275: BEEP .003,R
ND*50: NEXT f: CLS
4015 INK 2: PRINT AT 5,14;"NO";A
T 6,14;"PQ";AT 7,14;"RS"
4019 FOR f=1 TO 5
4020 INK 1: PRINT AT 8,13;"(sp,i
g8,sp)";AT 9,14;"(2*ig8)";AT 10,
14;"(g5,ig5)";AT 11,14;"(2*g3)"
4021 BEEP .3,40
4025 PRINT AT 8,13;"(g3,g7,ig4,g
3)": PRINT AT 9,13;"(sp,g5,ig5,s
p)"
4026 BEEP .3,20
4027 NEXT f
4028 PRINT AT 15,3;
4030 RESTORE 4035: FOR n=1 TO 2:
 FOR f=1 TO 3: READ a,b,w$: PRIN
T w$;: BEEP a,b: NEXT f: PAUSE 2
0: NEXT n
4035 DATA .5,12,"CLIVE ",.25,9,"
SIN",.5,5,"CLAIR ",.5,14,"SUP",.
25,10,"ER-",.5,5,"STAR"
4040 FOR f=1 TO 100: NEXT f: CLS

4045 PRINT AT 8,0; INK 1;"Uncle
Clive has taken you to(4*sp)Camb
ridge where you will live(3*sp)w
ith him at Sinclair Research.(2*
sp)"
4050 PRINT '' INK 2;"(2*sp)DO YO
U WANT TO TRY AGAIN AT(3*sp9ACHI
EVING THIS INCREDIBLE FEAT ?"
4055 GO TO 8010
8000 BORDER 6: PAPER 6: INK 0: C
LS
8005 PRINT AT 8,4; FLASH 1; PAPE
R 1; INK 7;"DO YOU WANT ANOTHER
GO ?"
8010 PRINT '''''TAB (9);"( yes o
r no )"
8015 INPUT a$
8020 IF a$<>"yes" AND a$<>"no" T
HEN  GO TO 8015
8025 IF a$="yes" THEN  RUN 130
8065 BORDER 0: PAPER 0: INK 7: C
LS : PRINT AT 3,0;"THIS PROGRAM
WILL NOW"''"SELF-DESTRUCT"
8066 FOR s=100 TO 0 STEP -1
8067 PRINT AT 10,10;s;"(2*sp)":
FOR x=1 TO 10: NEXT x: NEXT s
8068 PRINT AT 10,9; FLASH 1;"BAN
G"
8069 FOR x=1 TO 200: NEXT x: RAN
DOMIZE USR 0
9999 LOAD ""CODE : GO TO 5
```

Listing 2

```
9000 FOR a=144 TO 163
9001 FOR x=0 TO 7: READ d
9002 POKE USR CHR$ (a)+x,d
9003 NEXT x
9004 NEXT a
9010 DATA 0,0,24,165,165,90,36,1
26
9015 DATA 165,165,126,60,90,24,2
4,60
9020 DATA 0,57,126,255,85,0,0,0
9025 DATA 0,156,126,255,170,0,0,
0
9030 DATA 0,1,6,31,61,124,244,80
9035 DATA 0,128,96,248,188,62,47
,10
9040 DATA 98,149,136,82,68,37,65
,137
9045 DATA 56,196,66,17,33,70,82,
9
9050 DATA 148,100,66,152,160,82,
36,27
9055 DATA 161,18,20,4,130,81,105
,134
9060 DATA 0,0,24,126,255,255,255
,255
9065 DATA 28,93,42,28,28,28,20,3
4
9070 DATA 28,28,8,62,93,28,20,8
9075 DATA 7,24,48,96,96,237,210,
222
9080 DATA 224,24,12,6,6,183,75,1
23
9085 DATA 210,205,65,66,66,65,39
,40
9090 DATA 75,51,2,2,2,130,228,20
9100 DATA 43,24,28,15,7,2,2,2
9105 DATA 212,24,56,240,224,64,6
4,64
9110 DATA 126,126,126,126,60,24,
60,126
```

ARI Vidar Johanssen of Reykjavik, Iceland sent an arcade game for the 16K Spectrum. As the title suggests, you have to move round a network of paths keeping the home fires burning with your torch. Take care not to walk off the path or get burned by the fires. There are five levels of difficulty.

Graphics instructions are explained on the first page of Program Printout.

```
   0>REM
 Ari Vidar 1984 +++++
  10 GO SUB 3000
  20 DIM i$(704): DIM e(3): DIM
f(6): DIM l(3): DIM r$(21)
  25 LET hisc=0: LET h$=""
  30 PAPER 7: BORDER 1: INK 0: F
LASH 0: BRIGHT 0: OVER 0: CLS
  40 RANDOMIZE
  50 LET e(1)=6: LET e(3)=10: LE
T e(2)=14
  60 LET l(1)=9: LET l(2)=15: LE
T l(3)=21
  70 LET l=3: LET l1=3
  75 LET sc=0
  80 LET s1=6
  90 LET li=3
 100 PRINT AT 4,9; INK 1; PAPER
6; FLASH 1;"+ F I R E S +"
 130 IF INKEY$<>"" THEN  GO TO 1
30
 140 PRINT AT 12,3;"INSTRUCTIONS
 (Y OR N)? ";
 160 IF INKEY$="y" OR INKEY$="Y"
 THEN  GO TO 1660
 170 IF INKEY$="n" OR INKEY$="N"
 THEN  PRINT "NO": GO TO 1800
 200 GO TO 160
 460 PRINT  INK 1;AT 1,12;"(7*g8
)";AT 2,12;"(7*g8)"
 470 PRINT )1;AT 0,7;sc; INK 1;"
(2*g8)"
 480 RETURN
 500 IF s<=-2 THEN  GO TO 2250
 510 RESTORE 530
 520 FOR k=1 TO 6
 530 READ yc,xc
 540 IF f(k)=0 THEN  PRINT AT yc
,xc; FLASH 1; INK 0;"+"
 550 NEXT k
 600 GO TO 1580
 900 IF in=2 THEN  LET sc=sc-5:
BEEP .5,-30: LET xco=x: LET yco=
y: GO TO 970
 920 LET in=2: LET sc=sc+5
 940 PRINT AT yco,xco; INK 1;"X"
 945 LET l=l+1
 950 LET l1=INT (RND*3)+1
 955 IF l>3 THEN  LET l=1
 965 PRINT AT e(l),l(l1); INK 2;
 FLASH 1;"E"
 970 GO SUB 460: BEEP .01,10
 980 RETURN
1000 IF in=0 THEN  PRINT AT 1,14
;"GET";AT 2,13;"TORCH": FOR f=50
 TO -50 STEP -10: BEEP .1,f: NEX
T f: LET sc=sc-15: GO TO 1085
1010 PRINT AT 1,13;"FIRE!": BEEP
 .1,-20: BEEP .1,20
1020 RESTORE 1040
1025 PRINT AT yco,xco; INK 6; FL
ASH 1;"F"
1030 FOR k=1 TO 6
1040 READ yc,xc
1050 IF yco=yc AND xco=xc THEN
LET f(k)=INT (RND*100)+time
1060 NEXT k
1070 LET sc=sc+25
1075 LET time=time-2
1080 LET in=0
1085 GO SUB 460: LET xco=x: LET
yco=y
1090 RETURN
1095 DATA 2,10,2,20,10,3,10,27,1
8,10,18,20
1105 IF ATTR (yco,xco)=184 THEN
 GO TO 1000
1110 IF ATTR (yco,xco)=186 THEN
 GO TO 900
1120 IF ATTR (yco,xco)=190 THEN
 PRINT AT 1,12;"YOU ARE";AT 2,12
;"BURNING": FOR b=50 TO -50 STEP
 -25: BEEP .1,b: NEXT b: LET sc=
sc-5: GO TO 1180
1125 IF yco=y AND xco=x THEN  RE
TURN
1130 PRINT AT y,x; INK 1;"X"
1140 PRINT AT 1,14;"OFF";AT 2,13
;"PATH!"
1150 BEEP .5,-30
1160 POKE 23560,52
1170 LET sc=sc-10
1180 LET yco=y: LET xco=x
1190 GO SUB 460
1200 RETURN
1495 POKE 23560,52
1500 LET y=yco: LET x=xco
1510 LET xco=xco+(PEEK 23560=56)
-(PEEK 23560=53)
1520 LET yco=yco+(x=xco AND PEEK
 23560=54)-(x=xco AND PEEK 23560
=55)
1530 IF SCREEN$ (yco,xco)<>"X" T
HEN  GO SUB 1100
1540 LET f(1)=f(1)-1
1545 LET f(2)=f(2)-1
1550 LET f(3)=f(3)-1
1555 LET f(4)=f(4)-1
1560 LET f(5)=f(5)-1
1565 LET f(6)=f(6)-1
1570 LET s=SGN f(1)+SGN f(2)+SGN
 f(3)+SGN f(4)+SGN f(5)+SGN f(6)
1575 IF s<>s1 THEN  GO TO 500
1580 LET s1=s
1585 IF yco=y AND x=xco THEN  GO
 TO 1595
1590 PRINT AT y,x; INK 1;"X"
1595 PRINT AT yco,xco; INK in;"E
"
1600 GO TO 1500
1660 CLS : RESTORE 1670
1670 FOR n=1 TO 16: READ c$
1675 PRINT AT 1+n,(16-LEN c$/2);
1680 FOR i=1 TO LEN c$
1685 PRINT c$(i);: BEEP .01,-10
1690 PAUSE 1: NEXT i
1695 NEXT n
1700 DATA "INSTRUCTIONS",""
1710 DATA "The object of the gam
e is to","prevent that fires go
out.","You'll die if more than t
hree","fires go out. You've got
three"
1715 DATA "lives. Before you lig
ht a fire","you must always get
```

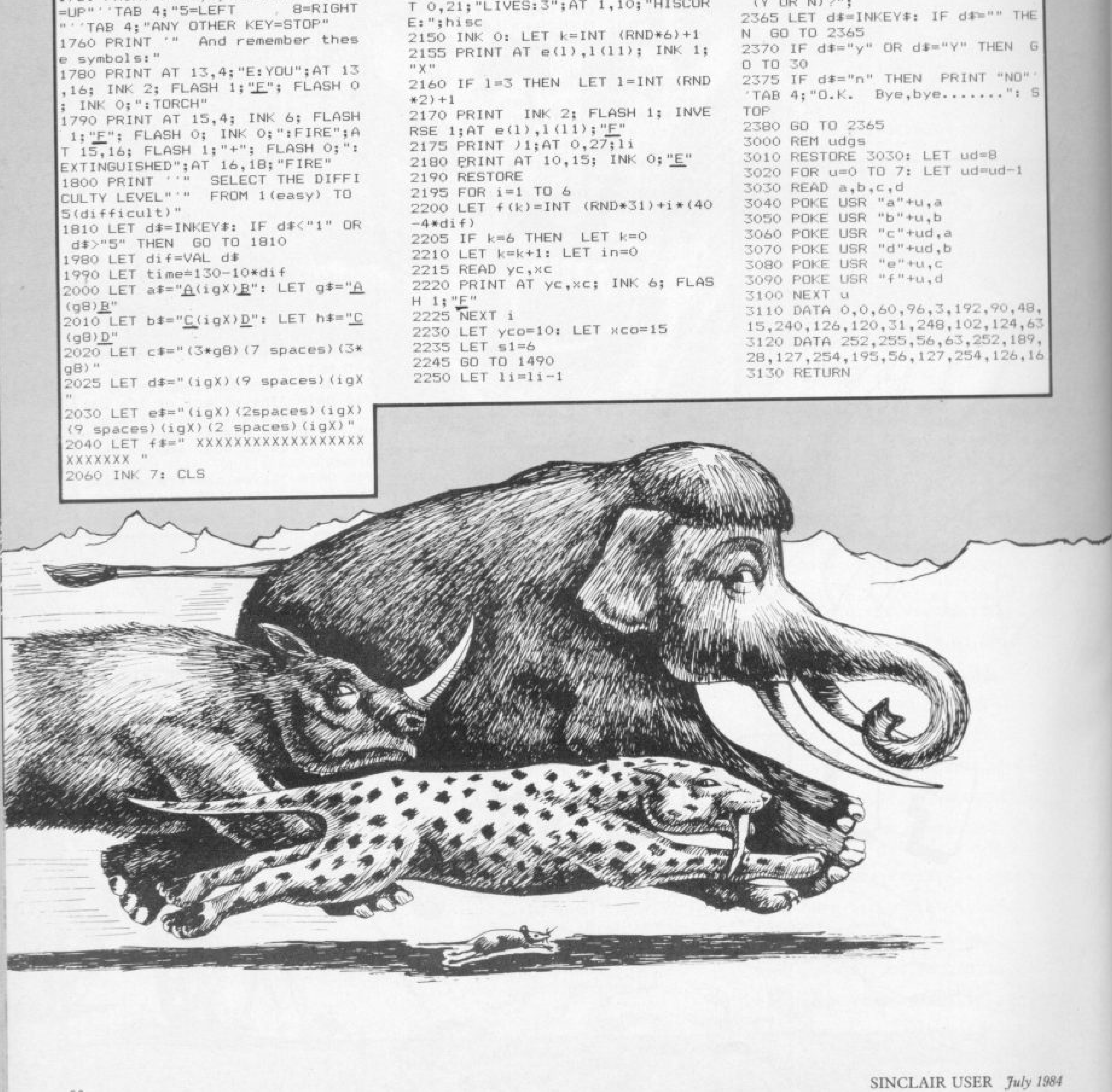
continued on page 80



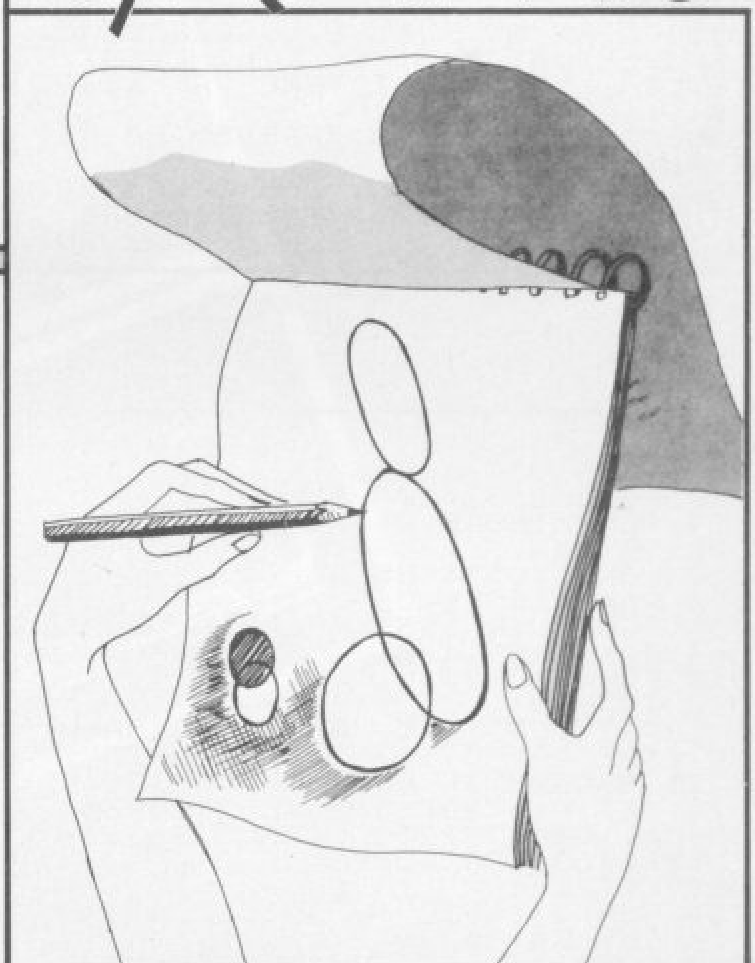


continued from page 79

```
a torch","to light the fire with
.","You'll get negative points i
f"
1720 DATA "you make a mistake, e
.g. if","you try to light a fire
 with-","out a torch.","","","PR
ESS 'ENTER' TO CONTINUE"
1730 IF INKEY$<>CHR$ 13 THEN  GO
 TO 1730
1735 CLS
1740 PRINT AT 1,9;"INSTRUCTIONS"
''"  The control keys are:"
1750 PRINT AT 5,4;"6=DOWN       7
=UP"''TAB 4;"5=LEFT      8=RIGHT
"''TAB 4;"ANY OTHER KEY=STOP"
1760 PRINT '"  And remember thes
e symbols:"
1780 PRINT AT 13,4;"E:YOU";AT 13
,16; INK 2; FLASH 1;"F"; FLASH 0
; INK 0;":TORCH"
1790 PRINT AT 15,4; INK 6; FLASH
 1;"F"; FLASH 0; INK 0;":FIRE";A
T 15,16; FLASH 1;"+"; FLASH 0;":
EXTINGUISHED";AT 16,18;"FIRE"
1800 PRINT ''"  SELECT THE DIFFI
CULTY LEVEL"'"  FROM 1(easy) TO
5(difficult)"
1810 LET d$=INKEY$: IF d$<"1" OR
 d$>"5" THEN  GO TO 1810
1980 LET dif=VAL d$
1990 LET time=130-10*dif
2000 LET a$="A(igX)B": LET g$="A
(g8)B"
2010 LET b$="C(igX)D": LET h$="C
(g8)D"
2020 LET c$="(3*g8)(7 spaces)(3*
g8)"
2025 LET d$="(igX)(9 spaces)(igX
"
2030 LET e$="(igX)(2spaces)(igX)
(9 spaces)(igX)(2 spaces)(igX)"
2040 LET f$=" XXXXXXXXXXXXXXXXXX
XXXXXXX "
2060 INK 7: CLS
2070 FOR y=2 TO 18
2075 BEEP .01,y*2
2080 PRINT AT y,10;(d$ AND y<6)+
(d$ AND y>14);AT y,7;e$ AND y>=6
 AND y<=14;AT y,9;(c$ AND y=2)+(
c$ AND y=18)
2090 NEXT y
2100 PRINT  INVERSE 1;AT 6,8;f$(
2 TO 16);AT 14,8;f$(2 TO 16);AT
10,2;f$
2110 PRINT AT 1,9;g$;AT 1,19;g$;
AT 9,2;g$;AT 9,26;g$;AT 17,9;a$;
AT 17,19;a$;AT 9,14;g$
2120 PRINT AT 3,9;b$;AT 3,19;b$;
AT 11,2;h$;AT 11,26;h$;AT 19,9;h
$;AT 19,19;h$;AT 11,14;h$
2130 PRINT AT 0,0; INK 1; INVERS
E 1; OVER 1;i$
2140 PRINT )1;AT 0,1;"SCORE:0";A
T 0,21;"LIVES:3";AT 1,10;"HISCOR
E:";hisc
2150 INK 0: LET k=INT (RND*6)+1
2155 PRINT AT e(1),l(11); INK 1;
"X"
2160 IF l=3 THEN  LET l=INT (RND
*2)+1
2170 PRINT  INK 2; FLASH 1; INVE
RSE 1;AT e(1),l(11);"F"
2175 PRINT )1;AT 0,27;li
2180 PRINT AT 10,15; INK 0;"E"
2190 RESTORE
2195 FOR i=1 TO 6
2200 LET f(k)=INT (RND*31)+i*(40
-4*dif)
2205 IF k=6 THEN  LET k=0
2210 LET k=k+1: LET in=0
2215 READ yc,xc
2220 PRINT AT yc,xc; INK 6; FLAS
H 1;"F"
2225 NEXT i
2230 LET yco=10: LET xco=15
2235 LET s1=6
2245 GO TO 1490
2250 LET li=li-1
2260 IF li THEN  FOR g=6 TO 1 ST
EP -1: BEEP .1,10*g-20: PRINT AT
 0,0; OVER 1; INK g;i$: NEXT g:
PRINT AT y,x; INK 1;"X": GO TO 2
150
2275 FOR g=25 TO 0 STEP -1
2280 OUT 254,INT (RND*32)
2285 BEEP .01,2*g
2290 NEXT g
2295 CLS : IF sc<=hisc THEN  GO
TO 2330
2300 LET hisc=sc
2305 BEEP .3,10: BEEP .6,20
2310 PRINT AT 5,11; FLASH 1;"WEL
L DONE!";AT 7,7; INVERSE 1;"TODA
Y'S BEST SCORE"
2320 PRINT 'TAB 5;"ENTER YOUR NA
ME PLEASE": INPUT ;r$
2330 PRINT AT 1,4;"TODAY'S HIGHS
CORE IS ";hisc'TAB 4;"BY ";r$
2350 PRINT AT 11,6;"YOU SCORED:
";SC
2360 PRINT AT 13,4;"ANOTHER GAME
 (Y OR N)?";
2365 LET d$=INKEY$: IF d$="" THE
N  GO TO 2365
2370 IF d$="y" OR d$="Y" THEN  G
O TO 30
2375 IF d$="n" THEN  PRINT "NO"'
'TAB 4;"O.K.  Bye,bye.......": S
TOP
2380 GO TO 2365
3000 REM udgs
3010 RESTORE 3030: LET ud=8
3020 FOR u=0 TO 7: LET ud=ud-1
3030 READ a,b,c,d
3040 POKE USR "a"+u,a
3050 POKE USR "b"+u,b
3060 POKE USR "c"+ud,a
3070 POKE USR "d"+ud,b
3080 POKE USR "e"+u,c
3090 POKE USR "f"+u,d
3100 NEXT u
3110 DATA 0,0,60,96,3,192,90,48,
15,240,126,120,31,248,102,124,63
3120 DATA 252,255,56,63,252,189,
28,127,254,195,56,127,254,126,16
3130 RETURN
```



GRAPHICS AID



GRAPHICS AID from N P Haddock of Sittingbourne, Kent is a utility program for the ZX-81 with 16K RAM pack enabling you to draw circles and ellipses or lines to create screen pictures.

Before entering the program you must POKE 16389, 121. The program contains a short machine code routine at line 7000 which is loaded into the REM statement at line 1 when the program runs, so make sure there are 38 spaces in the 1 REM statement.

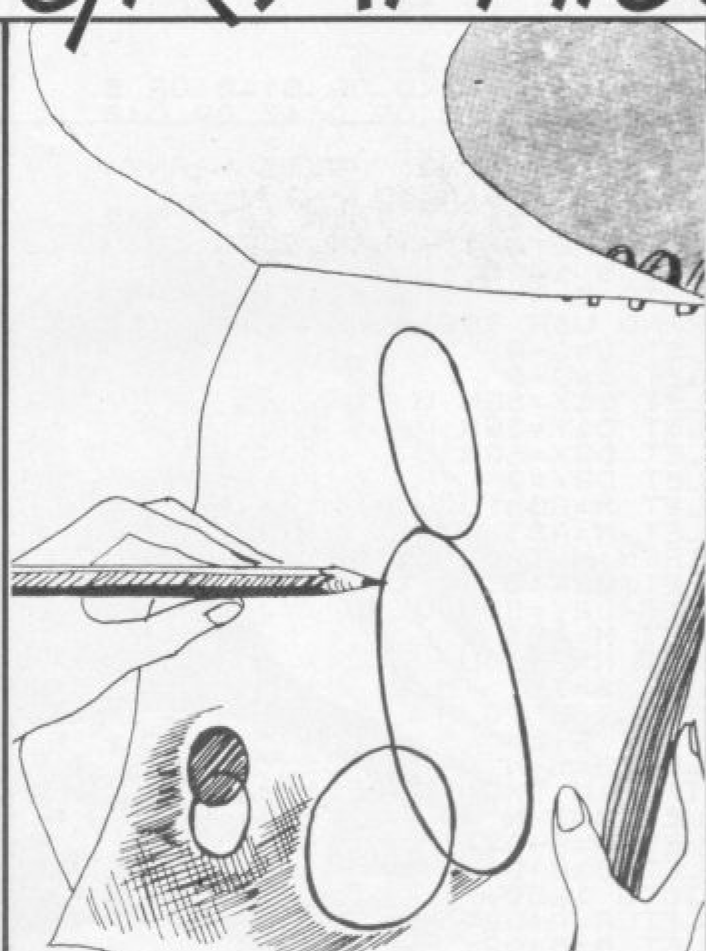
```
   1 REM
   2 GOSUB 7000
   3 RAND USR 16516
   4 GOSUB 5000
   5 GOSUB 6000
   6 LET M$=INKEY$
   7 IF M$<>"K" AND M$<>"L" AND
M$<>"E" AND M$<>"C" THEN GOTO 6
   8 GOSUB (11 AND M$="L")+(8500
 AND M$="K")+(3000 AND M$="C")+(
8000 AND M$="E")
   9 LET A$=""
  10 GOTO 5
  11 CLS
  15 PRINT AT 0,0;"LINE DRAWING"
  20 PRINT AT 8,0;"ENTER X AND Y
 COORDINATES OF    THE START OF
THE LINE";AT 15,5;"START:";AT 17
,6;"X=";AT 19,6;"Y="
  30 INPUT A
  40 PRINT AT 17,8;A
  50 INPUT B
  60 PRINT AT 19,8;B
  70 PRINT AT 8,0;"NOW ENTER THE
 X AND Y COORDS      OF THE END OF
 THE LINE"
  80 PRINT AT 15,20;"FINISH:";AT
 17,21;"X=";AT 19,21;"Y="
  90 INPUT C
 100 PRINT AT 17,23;C
 110 INPUT D
 120 PRINT AT 19,23;D
 125 IF A>60 OR A<0 OR B>40 OR B
<0 OR C>60 OR C<0 OR D>40 OR D<0
 THEN GOTO 11
 130 PRINT AT 21,0;"PRESS --ANY-
- KEY TO DRAW LINE"
 140 IF INKEY$<>"" THEN GOTO 140
 150 IF INKEY$="" THEN GOTO 150
 160 GOSUB 1000
 170 GOTO 5
1001 RAND USR 16534
1002 LET U=C-A
1010 LET V=D-B
1020 LET D1X=SGN U
1030 LET D1Y=SGN V
1040 LET D2X=SGN U
1050 LET D2Y=0
1060 LET M=ABS U
1070 LET N=ABS V
1080 IF M>N THEN GOTO 1130
1090 LET D2X=0
1100 LET D2Y=SGN V
1110 LET M=ABS V
1120 LET N=ABS U
1140 LET S=INT (M/2)
1150 FOR I=0 TO M
1160 PLOT A,B
1170 LET S=S+N
1180 IF S<M THEN GOTO 1230
1190 LET S=S-M
1200 LET A=A+D1X
1210 LET B=B+D1Y
1220 GOTO 1250
1230 LET A=A+D2X
1240 LET B=B+D2Y
1250 NEXT I
1260 RAND USR 16516
1261 IF A$="Y" THEN RETURN
1265 GOSUB 2000
1280 RETURN
2000 POKE 16418,0
2010 PRINT AT 23,0;"PRESS --ANY-
- KEY TO CONTINUE     "
2020 IF INKEY$<>"" THEN GOTO 202
0
2030 IF INKEY$="" THEN GOTO 2030
2040 PRINT AT 23,0;"
                    "
2050 POKE 16418,2
2060 RETURN
3000 CLS
3010 PRINT AT 8,0;"ENTER X AND Y
 COORDINATES OF THECENTRE OF THE
 CIRCLE:"
3020 PRINT AT 12,5;"COORDS:";
3030 PRINT AT 14,7;"X=";AT 16,7;
"Y="
3040 INPUT X
3050 PRINT AT 14,9;X
3060 INPUT Y
3070 PRINT AT 16,9;Y
3075 IF X>60 OR X<0 OR Y>40 OR Y
<0 THEN GOTO 3000
3080 PRINT AT 8,0;"NOW ENTER THE
 X AND Y RADII FOR THE CIRCLE OR
ELIPSE              "
3090 PRINT AT 12,22;"RADII:"
3100 PRINT AT 14,24;"X=";AT 16,2
4;"Y="
3110 INPUT XR
3120 PRINT AT 14,26;XR
3125 INPUT YR
3130 PRINT AT 16,26;YR
3135 PRINT AT 8,0;"HOW MANY POIN
TS ARE TO BE        PLOTTED ?
    (10-500)"
3136 INPUT P
3137 PRINT AT 0,0;"DO YOU WANT A
 LINE FROM EACH     POINT TO THE
CENTRE ?    (Y/N)      "
3138 INPUT A$
3139 IF A$<>"Y" AND A$<>"N" THEN
 GOTO 3138
3140 PRINT AT 21,0;"PRESS --ANY-
- KEY TO DRAW CIRCLE"
3150 IF INKEY$<>"" THEN GOTO 315
0
3160 IF INKEY$="" THEN GOTO 3160
```

continued on page 82

continued from page 81

```
3170 CLS
3180 RAND USR 16534
3190 FOR K=0 TO P
3200 LET XX=K/(P/2)*PI
3210 LET D1X=X+XR*SIN XX
3220 LET D1Y=Y-YR*COS XX
3230 IF D1X>60 OR D1X<0 OR D1Y>4
0 OR D1Y<0 THEN GOTO 3250
3240 PLOT D1X,D1Y
3245 IF A$="Y" THEN GOSUB 4000
3250 NEXT K
3255 RAND USR 16516
3260 POKE 16418,0
3270 PRINT AT 23,0;"PRESS --ANY-
- KEY TO CONTINUE"
3280 IF INKEY$<>"" THEN GOTO 328
0
3290 IF INKEY$="" THEN GOTO 3290
3300 POKE 16418,2
3320 GOTO 5
4000 LET A=D1X
4010 LET B=D1Y
4020 LET C=X
4030 LET D=Y
4040 GOSUB 1002
4050 RETURN
5000 POKE 16514,25
5010 POKE 16515,3
5020 PRINT AT 0,12;"MENU";AT 1,1
2;"▀▀▀▀"
5030 PRINT AT 4,5;"C....CIRCLE O
R ELIPSE";AT 6,5;"L....LINE";AT
8,5;"E....ERASE PICTURE";AT 10,5
;"K....CURSOR KEYS"
5040 PRINT AT 14,0;"PRESS THE RE
LEVANT KEY"
5050 PRINT AT 19,0;"THE COMPUTER
 WILL ALWAYS STORE  THE PICTURE
IN ITS MEMORY           UNLESS RE-RU
N BY YOU."
5060 RAND USR 16516
5070 POKE 16514,0
5080 POKE 16515,0
5090 RETURN
6010 POKE 16514,25
6020 POKE 16515,3
6030 RAND USR 16534
6040 POKE 16514,0
6050 POKE 16515,0
6060 RETURN
7000 PRINT AT 0,5;"ENTERING MACH
INE CODE";AT 3,10;"PLEASE WAIT";
AT 10,5;"GRAFIK ADE (C)NPH 1984"
7001 LET A$="2A0440ED4B824009EB2
A0C40011903EDB0C92A0440ED4B82400
9ED5B0C40011903EDB0C9"
7002 LET X=1
7005 FOR I=16516 TO 16551
7010 LET X$=A$(X TO X+1)
7020 POKE I,16*CODE X$+CODE X$(2
)-476
7025 LET X=X+2
7030 NEXT I
7040 CLS
7050 RETURN
8000 CLS
8010 RAND USR 16516
8020 RETURN
8500 CLS
8510 PRINT AT 10,0;"INPUT THE X
AND Y COORDS OF THE STARTING POI
NT"
8520 PRINT AT 13,5;"X=";AT 15,5;
"Y="
8530 INPUT X
8540 PRINT AT 13,7;X
8550 INPUT Y
8560 PRINT AT 15,7;Y
8565 IF X>60 OR X<0 OR Y>40 OR Y
<0 THEN GOTO 8500
8570 PRINT AT 21,0;"PRESS --ANY-
- KEY TO START";AT 19,3;"PRESS "
"X"" TO EXIT ROUTINE"
8580 PRINT AT 0,0;"USE THE CURSO
R KEYS   5 6 7 8   FOR STRAIGHT
LINES,   Q A P L   FOR DIAGONAL
LINES"
8590 IF INKEY$<>"" THEN GOTO 859
0
8600 IF INKEY$="" THEN GOTO 8600
8610 RAND USR 16534
8620 PLOT X,Y
8630 IF INKEY$="X" THEN GOTO 875
0
8640 LET X=X+(INKEY$="8" AND X<6
0)-(INKEY$="5" AND X>0)
8650 LET Y=Y+(INKEY$="7" AND Y<4
0)-(INKEY$="6" AND Y>0)
8660 IF INKEY$="Q" THEN LET X=X-
(X>0)
8670 IF INKEY$="Q" THEN LET Y=Y+
(Y<40)
8680 IF INKEY$="A" THEN LET X=X-
(X>0)
8690 IF INKEY$="A" THEN LET Y=Y-
(Y>0)
8700 IF INKEY$="P" THEN LET X=X+
(X<60)
8710 IF INKEY$="P" THEN LET Y=Y+
(Y<40)
8720 IF INKEY$="L" THEN LET X=X+
(X<60)
8730 IF INKEY$="L" THEN LET Y=Y-
(Y>0)
8740 GOTO 8620
8750 RAND USR 16516
8760 RETURN
9997 CLEAR
9998 SAVE "**█"
9999 RUN
```

GRAPHICS AID




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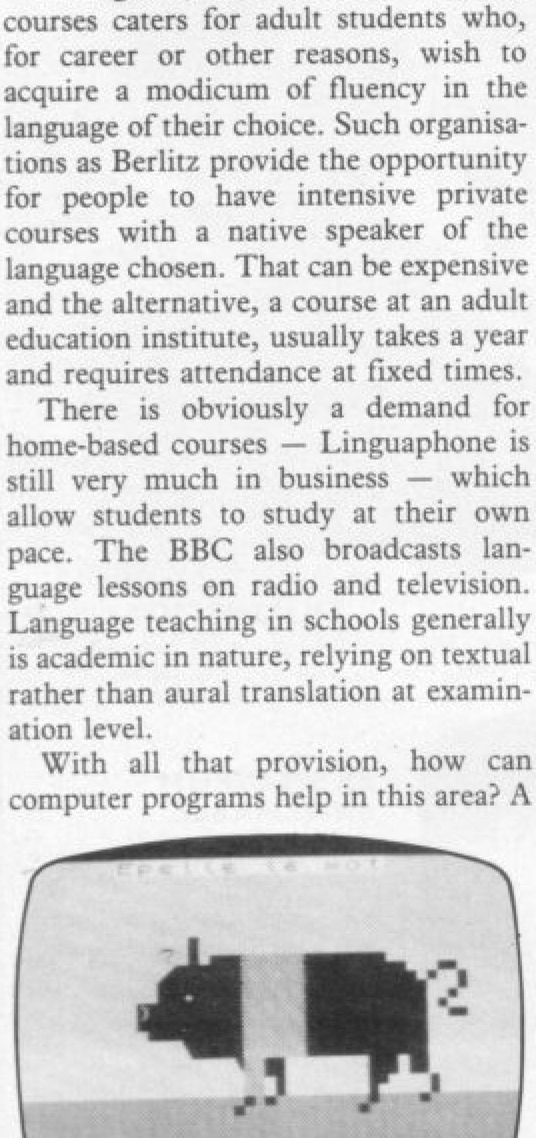
Theodora Wood assesses the value of software which helps you learn the lingo

THE BEST WAY to learn a foreign language is undoubtedly to live in the country where that language is spoken, preferably in a part of the country where English is not spoken much and the learner is required to understand and use the language for survival. That option is available only to those who work or study overseas, or have sufficient funds to stay there while learning the language.

In England, the market for language courses caters for adult students who, for career or other reasons, wish to acquire a modicum of fluency in the language of their choice. Such organisations as Berlitz provide the opportunity for people to have intensive private courses with a native speaker of the language chosen. That can be expensive and the alternative, a course at an adult education institute, usually takes a year and requires attendance at fixed times.

There is obviously a demand for home-based courses — Linguaphone is still very much in business — which allow students to study at their own pace. The BBC also broadcasts language lessons on radio and television. Language teaching in schools generally is academic in nature, relying on textual rather than aural translation at examination level.

With all that provision, how can computer programs help in this area? A



Spelling Bee

computer program generally can help most in the context of textual rather than the aural level, testing vocabulary and grammar by interactive marking and correcting mistakes made immediately. Spelling programs designed specifically for English spelling are not really suitable for foreign languages, which may require accents and other special inflexions to be totally correct.

Spelling Bee — Image Systems, Spectrum 48K, £6 — has attempted to deal with the problem by offering either an English or a French version of a spelling tester. The English version is aimed at the age range from four to six. Spelling is tested by showing a picture and the child has to ENTER the correct spelling. The French option obviously is intended to appeal to older junior children who may have just started learning the language.

If the French option is chosen, all the instructions are in French. Like the English versions, there are five options, with 10 words tested in each. There is no HELP screen for accents and when one is required the user has to press 'i' and ENTER for a table of accents, which seems unnecessarily complicated. Two programs are provided in the package, EASY and HARD, so that a total vocabulary list of 100 words may be learned. The French words must be entered with the definite article le, la and l' so a knowledge of gender is required.

In the simpler testing section, the child has to ENTER the word for the whole picture — a picture of a fish requires 'le poisson'. In the more difficult sections a part of the object must be named like the scale of the fish or the ear of the pig. That can be confusing, as the question mark for the appropriate word could refer to either the pig's head or the pig's ear.

Spelling Bee, although appealing to spelling beginners because of its graphics, is obviously limited since there is no opportunity to change the vocabulary. It is also limited in its range of nouns and there is no opportunity to learn phrases. The English section has the same limitations and, compared to such programs as **Castle Spellerous** — Sinclair, Blackboard Software — has very little appeal.

Eiffel Tower — Chalksoft, Spectrum 48K, £9.25 — allows entry of new vocabulary lists which extends the usefulness of the program. There are up to 10 word lists on both sides of the tape. The program begins with a picture of the Eiffel Tower and asks how quickly can you build the Tower and can you become a master builder? The menu appears next with the 10 given choices grouped generally in subject areas, such as about the house or medical, as well as mixed vocabulary lists.

Option 11 allows the user to add a new word list and 12 allows the new word list to be used. After a particular option has been chosen, the student is asked to guess a word, with an English clue given — for example, Guess this word, clue, a cup. If the word is ENTERed incorrectly there is a help section simultaneously on the screen containing the coding for accents — in this case on the numbers one to eight.

Typing errors can be corrected by pressing 0. Each time a correct entry is made a part of the tower is completed and when building has finished a small section of the *Marseillaise* is played, together with the time taken to build it, although 32 days seems a little unrealistic.

At the end of each section there is a choice of the same words or returning to the menu to make a new choice. If option 11 is chosen — make your own word list — a secondary menu is presented on-screen which sets out the procedure for entry of new words and SAVEing the new list.

Eiffel Tower is a useful program within its limitations; it is what it sets out to be, a French vocabulary test reminiscent of all those vocabulary tests given in school language lessons. Being an interactive program, it not only tests knowledge of vocabulary but also corrects and provides answers when words are not known. In that respect it is successful.

It has to be said, however, that testing foreign words in isolation from the spoken context is not a particularly good method of learning a language, especially as there is no sound input and the acquisition of vocabulary by this

EDUCATION



means is highly dependent on rote learning. Nevertheless, Eiffel Tower provides a facility which would be impossible without the power of a computer and could prove a useful aid to children from nine upwards, bearing in mind its overall limitations.

Chalksoft also produces a German version, **Das Schloss,** on similar lines, the object being to build a German castle. A Spanish version is due shortly.

The Linkword series of language learning programs covers French, Spanish, Italian or German — Silversoft Ltd, Spectrum 48K, £12.95 — and shows a new approach to acquisition of a foreign language. The course is designed for holidaymakers, businessmen and older children and is not intended as an academic course.

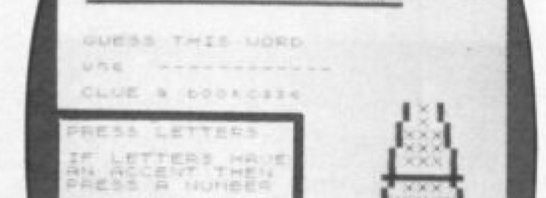
Based on Dr Gruneberg's theory that memory retention is enhanced by mnemonics, the course provides a cassette with 10 programs and an audio cassette containing the spoken words. Nouns are dealt with first with the name in Spanish, followed by the English name and then a phrase which fixes the word in the user's memory. Examples include the Spanish for onion is Cebolla (Thebolya) — imagine an onion leaning to another and saying "They boil you in this place"; and the Spanish for cheese is Queso (Keso) — imagine a Case o Cheese.

After memorising the list of words in each section, the user is asked to ENTER first the English equivalent of Spanish words and vice versa. Accents are not used in the exercises but are given in full in the booklet accompanying the tapes. Correct answers are shown after each word has been entered.

Grammar is presented at the end of each lesson but is not the most important aspect of the program; it is stated categorically that the main aim of the package is for the user to become fluent and to be able to comprehend the language rather than have the minutiae of grammar correct.

The use of imaginative mnemonics makes the Linkword series exceptional in the field of language learning and it certainly is an aid to remembering words which would otherwise be learned in rote fashion. Programs of this kind could be used by the whole family with children from 10 upwards and, if persistent, a vocabulary of about 350 words and simple grammar could be learned.

MDA Modon Associates has a much higher learning profile in its language packages, covering French, German and Spanish — Spectrum 48K, £29.95 each. Called the Personal Computer Superlearning System, great claims are made for this way of learning. The theory underlying the package is that, to complete a successful learning operation, the user needs to be completely relaxed. The booklet provides a clue to that viewpoint: "PCSS employs well-tried and tested techniques for relaxing the body and mind so that enhanced concentration is placed on memory and recall".



Eiffel Tower

Not only will the student find languages easier to learn in that enhanced state but should also discover increased confidence and composure, reduced stress, fewer headaches and ailments, better performance at work and more vigour.

The key to this wonderful panacea for all ills is the relaxation tape provided with the course. It is a combination of deep breathing exercises, together with tension/relaxation of the muscles from the toes upwards. Physical relaxation is covered first, where the even tone of the speaker urges the listener to relax first one part of the body then another. Mental relaxation is induced by imagining walking on a sunny beach. Then the user is asked to recall a moment when the memory really worked, such as a tough word in a crossword puzzle or an exciting learning experience he might have had as a child, recalling the exact feelings and attitudes.

Synchronised breathing is described in the last section of the tape, where the user is asked to breathe to a rhythm and finally to synchronise breathing with the learning package.

If, by that time, the user is fully relaxed he should continue to the lessons — if not asleep. PCSS provides 12 audio lessons on three cassettes; they run through all the most-used tenses of the regular verbs, pronouns, genders, possessive pronouns, reflexive verbs, together with vocabulary to cover such contingencies as the doctor's, the dentist's, restaurants, the office and the car.

Dialogue is introduced à la BBC after lesson three. The complete transcript of the audio lessons is printed in the literature accompanying the package, for revision purposes. Audio cassettes one to eight can be used with the two computer programs provided and are synchronised so that a page-turning exercise can be performed.

The audio tapes have an annoying hiss accompanying them, indicating that perhaps the "finest" of recording studios was not used, as stated in the literature. That was particularly obtrusive when used on a personal system with headphones, suggesting that the possibility of using spare time, on bus rides for example, which could be used gainfully by learning a foreign language would not be such a pleasant experience. The choice of music as background to the spoken language is mainly classical in tone, so it depends on personal preference whether that is

continued on page 88

EDUCATION

continued from page 87

conducive to learning. The main bulk of the computer section of the package is concerned once more with using the computer to correct textual entries. Called "interactive lessons", they work for translation both from and to the foreign language concerned.

There is a help screen for accents and inflexions. Correct answers are given after each entry and the user is asked to assess his score, from three to correct to 0 for not close.

The PCSS learning system is a Linguaphone-type course without high fidelity and, at its price, is slightly disappointing. The computer programs provide a more rigorous examination of grammar and vocabulary than any of the other programs reviewed, building to a vocabulary of about 1,500 words and phrases.

Compared to Linguaphone prices for European languages — French, German, Spanish — the price is fairly reasonable, as those courses are £135 for eight cassettes and four books with written exercises together with answers, building to a vocabulary of 1,500 to 3,000 words.

The computer programs obviously are more useful than written exercises in that repeated use can be made of them. MDA Modon Associates is releasing versions of its language programs specifically for retail outlets at £19.95.

Other language programs available are **French Is Fun, German Is Fun** — CDS Microsystems, Spectrum 16/48K, £5.95 — a vocabulary tester with graphics, and **Tense French** — Sulis Software, Spectrum 48K, £9.95 — a French verb tester, both reviewed previously in *Sinclair User*.

None of the programs prepares the user for the encounter with a native speaker who speaks three times as fast as the recordings with a strong regional accent, but they provide to a greater or lesser degree a basis from which to start. Vocabulary and grammar testers can be useful in their limitations to school children aged nine to 13 in rote learning their vocabulary lists at home.

Image Systems, 34 Lynwood Drive, Worcester Park, Surrey KT4 7AB.
Chalksoft Ltd, 37 Willowsea Road, Worcester W3 7QP.
Silversoft Ltd, London House, 271-273 King Street, London W6 9LZ.
MDA Modon Associated Ltd, 561 Upper Richmond Road West, London SW14 7ED.
CDS Microsystems, 10 Westfield Close, Tickhill, Doncaster, South Yorkshire.
Sulis Software, John Wiley & Sons Ltd, Baffins Lane, Chichester, Sussex PO19 1UD.

Title	Machine	Company	Price	Factor
Spelling Bee	Spectrum 48K	Image Systems	£6	5
Eiffel Tower	Spectrum 48K	Chalksoft	£9.95	6
Linkword	Spectrum 48K	Silversoft	£12.95	6
MDA-PCSS	Spectrum 48K	MDA Assoc.	£29.95	7

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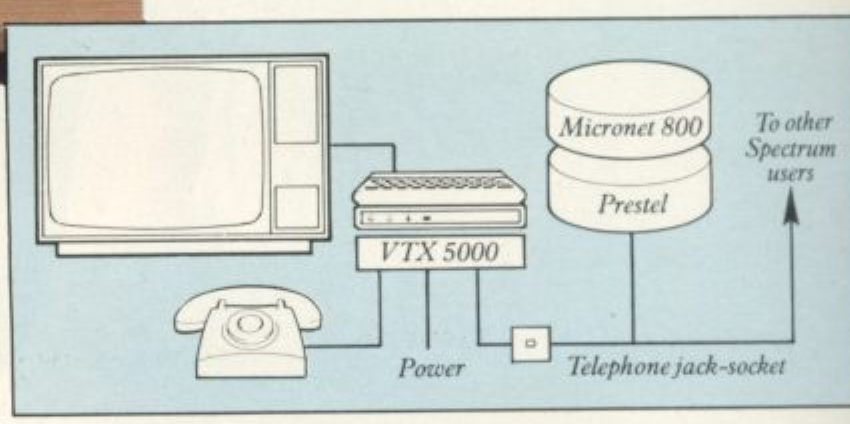




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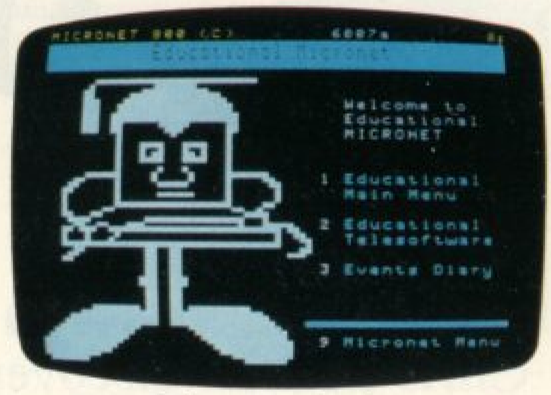
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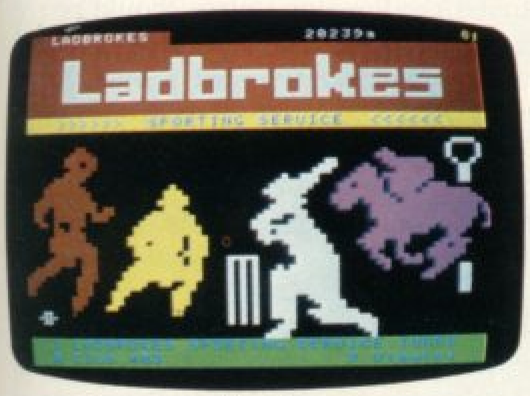
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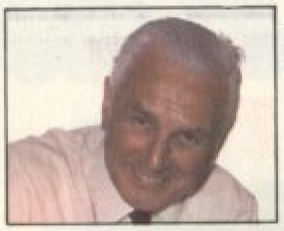
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Three of a kind

Chris Bourne discovers how the ZX-81 can bridge generation and communication gaps

EVEN PEOPLE who do not own a computer and have no interest in the subject are probably aware of the many uses to which microprocessor technology has been applied in the field of health care and research — there seems to be another new television documentary on some aspect of the subject every few weeks. Practical uses for more homely micros do not seem to have generated the same interest so far and the use of computers to help disabled people is limited generally to institutional care and education.

Sixty-eight-year-old Sinclair enthusiast Bert Maddocks has found a use for the ZX-81 which benefits his family out of all proportion to the complexity and cost of the machine.

The Maddocks family live at Runcorn, near Liverpool, and Maddocks' son Peter was born deaf. Nowadays deaf children can, if they go to a special school with access to the proper equipment, learn to talk by using a computer and an oscilloscope. The computer matches the frequency of the sounds made by the child with the correct frequencies for the word the child is learning and displays a waveform on the oscilloscope, thus enabling the child to see how close the sounds which he cannot hear are to the correct sounds. That technology was not available when Peter was learning to talk and to lip-read and today he is unable to use his voice effectively to communicate.

Peter is now 38 and married with two sons, Paul aged seven and two-year-old Ian. His problem was that he could not communicate easily with Paul, or help him with his homework and generally have the kind of relationship which other fathers would regard as normal. The humble ZX-81 has changed that.

Bert Maddocks is a chemical engineer and although he has been involved with computers since the early 1950s, when his company was one of the first in the area to use an IBM mainframe, he never had the opportunity to learn programming skills.

> 'High technology and handicapped people fit together very well'

"The IBM machine in those days was in an air-conditioned room and used punched tape. It was a holy of holies — you were not even allowed to breathe there. If anyone then had told me that in 15 years you could walk into a stationers and buy a 16K computer I would have said they were mad," he says.

He bought a ZX-81 to teach his grandson about computers and also as a part-time hobby. "My first impression was disappointment. It was so small, it looked like a toy."

The next step was to teach himself how to use it and Bert says he went through all the standard problems of ZX-81 owners, using sticky tape to secure the RAM pack and screened leads to reduce power supply problems. Once he had mastered the manual, he started looking for programs he could use. Many of the programs were from books and magazines. "I have nothing but praise for the magazines," he says. "*Sinclair User* is an excellent magazine."

All the programs he takes from magazines he personalises with Paul's name and other little alterations. Peter is now able to participate in his son's education to a much greater extent, with the two of them working together on 'grandpa's computer.' They also communicate directly by typing messages straight to the screen.

"It has brought them closer together," says Bert, "as well as giving me more involvement with my grandson."

Bert is a great champion of using modern technology to help disabled people. More than 30 years ago he helped form the North West Deaf Children's Association specifically to encourage the use of modern techniques. In the early 1950s the U.S. Air Force was experimenting on the effects of supersonic noise on pilots' eardrums, by wiring-up mice and subjecting their ears to sonic booms. Maddocks asked at the time whether it would ever be possible to wire up a deaf person so that the brain could receive the signals a defective ear could not supply. Of course, they said it was impossible but from the experiments a sophisticated microphone was developed which was of use in schools for the deaf.

"New technology should be used to help the deaf," he says. He believes the computer/oscilloscope system should be available in all special schools. "High technology and handicapped people fit together very well."

Young Paul is a bright, energetic boy who obviously enjoys using his grandfather's computer. He says he prefers learning on the computer because "it is peaceful and I am on my own." He also says it is pleasant not to have other people seeing all his mistakes.

Summer for the Maddocks family is the off-season for computing, as Paul would much rather be out in the evenings playing with his friends. Bert does most of his programming then, in preparation for the long winter nights. As far as commercial software is concerned, he finds the Muse programs excellent and also uses Educare.

Lest you form the impression that games have been completely forbidden in the Maddocks household in favour of more weighty matters, let me assure you they have not. The system which operates usually is that if Paul gets a score of eight out of 10 on an education program he is allowed to choose a game to play.

One of his favourites is still a simple

Space Wars program in 1K, which perhaps indicates that you do not have to spend a fortune on all the latest hi-res, state-of-the-art, all-action arcade games to enjoy your computer. Bert feels that arcade games are not very useful in themselves, however, and would prefer to have his grandson playing games which encourage a certain amount of thought, such as Golf, another Maddocks family favourite.

The main purpose of the ZX-81 so far as Peter is concerned is as a means of enabling a deaf person to teach his son, even though he has very little speech; whether or not Paul learns a great deal from the computer which he does not learn at school is a secondary matter.

His mother Jacqueline, who is also deaf, though less severely so than her husband, says Paul's spelling has improved tremendously since doing spelling tests on the computer. That is one area where most parents can usually help their children at home orally, but where a deaf person unable to articulate single letters is at a considerable disadvantage. There the ZX-81 has probably made a genuine difference to Paul's school-work.

Bert is now thinking of buying a more advanced computer for 'the team,' as he likes to call it but says they will still keep the ZX-81 and the old programs for little Ian, when he becomes old enough to benefit. He recalls that Peter started going to school when he was two years old, to learn speaking, lip-reading, and other basic skills vital to deaf people. He feels the same criteria apply to learning about computers and thinks children should grow up with them from the earliest ages to understand what will become an important part of their lives.

Remarkably energetic for his age, Bert is still working, using his long experience of chemical engineering to help re-train mechanical engineers made redundant as the recession bit deep into the Liverpool area's chemical engineers. "It is important that they, too, have exposure to computers and programs," he says.

I asked Bert if he had more plans or ideas for ways in which computers such as the ZX-81 could be used to help deaf people.

"Not really," he says. "We have a baby alarm with a flashing light, a light attached to the doorbell controls and a telephone light, but although those things could be done with a computer they do not need to be."

He says when be bought the machine he showed it to friends, who all asked "What does it do?" He could not think of anything to say. The point was to buy it to understand it.

When I left their attractive home Paul was playing on the computer while Peter and Jacqui swapped anecdotes with me in an animated mixture of words, sign language, lip-reading and mime. One should not exaggerate the impact Bert Maddocks and his ZX-81 have had on the household but if their happiness has been increased by the link between father and son, reinforced by the ZX-81, that is a telling argument against those who still regard an inexpensive home computer as nothing more than an expensive toy.

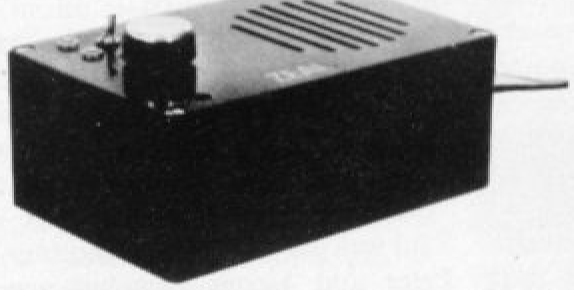
I identified one small area of conflict. Bert says his grandson wants to be a computer programmer when he grows up. I think we should let Paul have the last word — "I want to be a racing-car driver," he says.



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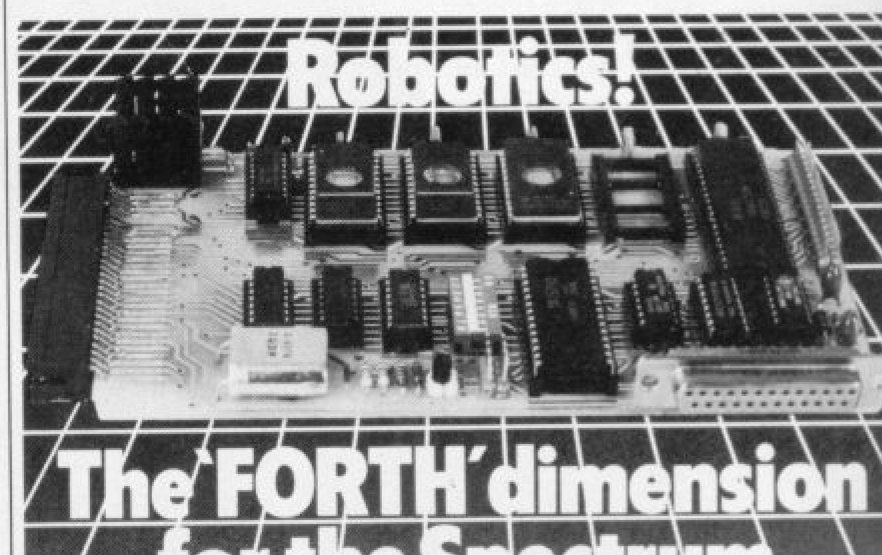
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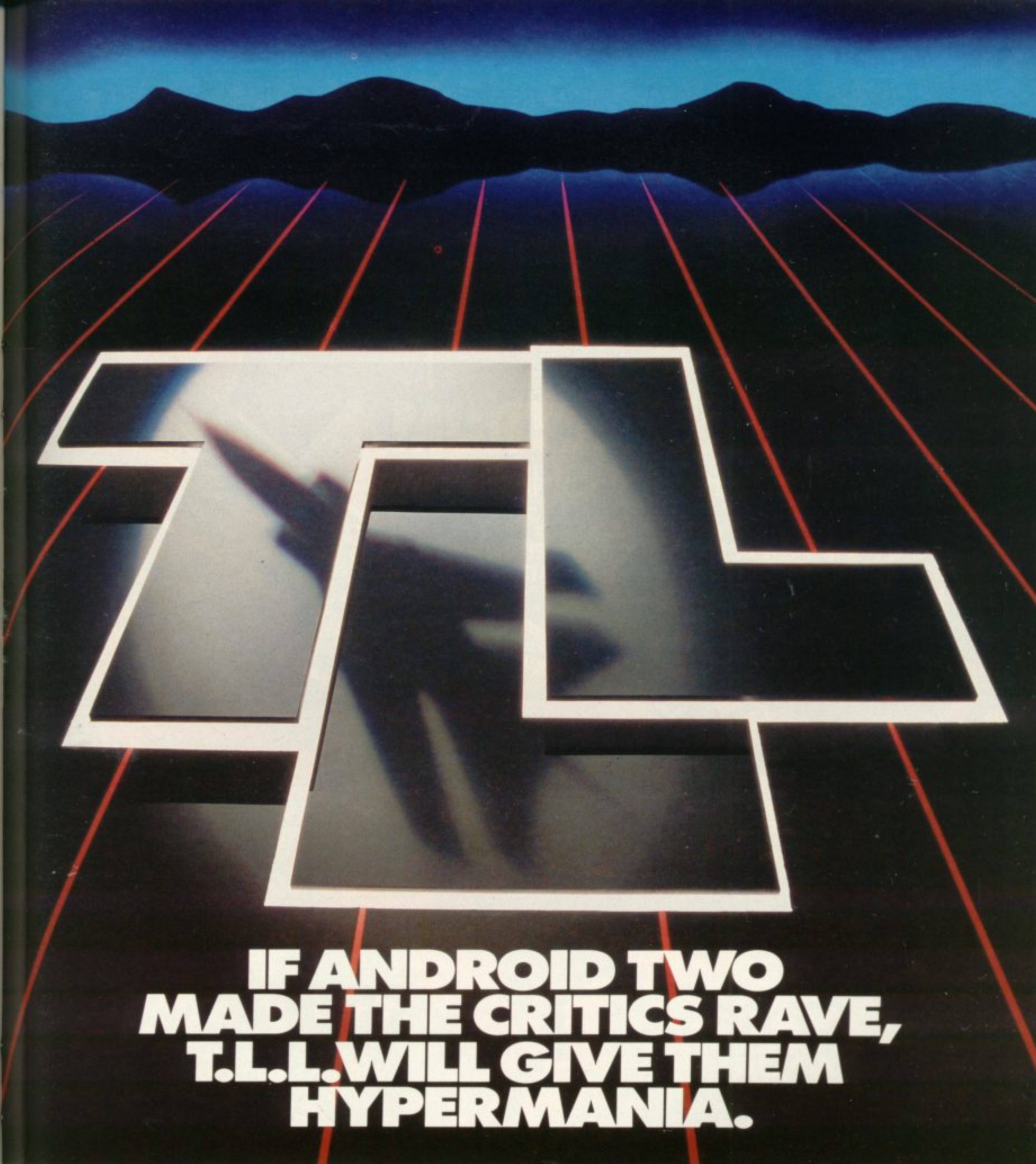
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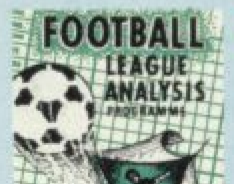
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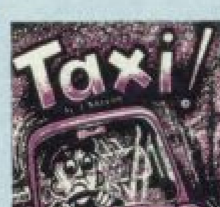
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GLOSSARY

Basic — Beginners' All-purpose Symbolic Instruction Code. A programming language resembling English which is used by beginners because most popular microcomputers have it as standard.

Bug — an error in a program.

EPROM — Erasable Programmable Read-Only Memory. Semi-permanent storage. Information is not erased if the power is turned off in the computer. Programs can be erased by subjecting the memory chips to ultra-violet light. The memory can then be re-programmed using an electrical device called an EPROM blower.

Interface — RS232 and Centronics. A device which enables other computers or add-ons, such as printers, to be connected to the computer. It converts non-standard signals from add-ons to the standard signals of the computer in use.

Kilobyte — (K). A measurement of memory size. Most machines use 16K as a minimum but 48K is generally agreed to be necessary for serious work.

Machine code — an electronic pulse code used by the computer to perform functions and communicate with memory and other devices.

Mnemonics — abbreviated instructions — for example LD for Load — used in machine language programming.

Motherboard — an external printed circuit board which is used like a multi-way plug planner. It enables other printed circuit boards, such as graphics boards and colour boards, to be slotted-in.

Port — a link to the outside world which can be used by programs and the computer.

PCB — printed circuit board. A board which has on it the electronic circuits of the computer.

RAM — Random Access Memory. Information and programs can be stored in this type of memory as electronic pulses which conform to a set of numbers — machine language — in which programs are represented in the computer. When the power is turned off the information will be lost.

ROM — Read Only Memory. Information stored in this type of memory is not lost when the power is switched off.

Software — programs which control the operation of the computer.

Syntax error — a bug caused by incorrect use of a programming language.



Our easy-to-follow guide for new owners

The basic route to a habit-forming hobby

BUYING a Sinclair machine can be the start of a life-time's obsession with home computing. It is easy, however, to become discouraged if everything does not go according to plan from the beginning.

For those with only a little knowledge of computers and their capabilities, the best way to approach the machines is to abandon any ideas for special uses. While the 48K Spectrum is big enough for simple uses in small businesses, the range of Sinclair computers does not contain machines for major uses. It is better to become accustomed to the many facilities and then decide how you wish to use them.

Begin by unpacking your machine, overcoming your surprise at its size and weight and, following the manual, set up the system. If you cannot get the K on the screen, check that everything is plugged into its correct socket and re-set the machine by pulling-out the power plug for one second and try tuning-in again. If still nothing appears, check the power supply unit by shaking it. If it rattles, return it. If it is satisfactory, check your system with that of a friend.

If you have a Spectrum you will have received an introductory booklet which explains what the computer can do and giving detailed instructions on how to set it up. Also included is a fault-finding guide.

Once the K appears you are ready to begin learning about your machine. It can prevent family arguments if you can afford a separate television set for your system. It also makes life easier if you find somewhere to leave your equipment set up permanently. You will find that a few power sockets are needed and a four-way block connector on a short length of extension cable will help to tidy trailing leads.

When using a Spectrum, a television set has to be more finely-tuned than when using a ZX-81 because of the added dimension of colour. If the set is not tuned properly, the colours will look hazy instead of sharp and clear. If no colour can be seen when it is switched on, the power supply or the television set may be at fault.

Some users have experienced some difficulty with some television sets, which include Hitachi, Grundig and Toshiba. Sets which many people have found compatible include the Sony Trinitron, Fidelity and Ferguson. Recent changes in the ULA should make more sets compatible.

The manuals are written in great detail and are reasonably easy to follow. Some of the chapters may not seem immediately relevant but it is worthwhile reading them as you might miss something important.

Patience is needed at that stage to learn the ways in which the computer will accept information. It is tempting to try to enter programs before you are ready but that is likely to lead to errors. For example, words like AND, THEN and AT should not be typed-in letter by letter.

By the time you have reached chapter 11 in the ZX-81 manual and chapter 19 in the Spectrum manual you should have accumulated sufficient knowledge to be

continued on page 100

continued from page 99

able to type-in other people's programs, such as those in *Sinclair User* and *Sinclair Programs*, without too much difficulty.

It is important when using the ZX-81 that it is not jolted. Some of the connections can easily work loose and everything which has been entered will be lost.

The manuals are not to everyone's liking and if you find them difficult to follow a number of books on the market can help you. Find the one which suits you best.

As a way of relaxing you can buy some of the growing range of commercially-produced software. That can be loaded directly from cassette but make sure that your machine is big enough to take the tapes you buy.

For the ZX-81 there are a few tapes for the unexpanded 1K machine but the majority require the 16K RAM pack. Similarly on the Spectrum most companies are taking advantage of the possibilities provided by the larger 48K machine rather than providing cassettes for the 16K.

The tapes can vary in quality and it is advisable to read the reviews in *Sinclair User* and use your judgment to find the best.

An alternative method to learn about both the ZX-81 and the Spectrum is to plunge in at the deep end and see what the machines will do. Refer to the manuals when you have difficulties. You can ignore the functions and calculations initially and experiment with PRINT statements to obtain the feel of the machines.

You may already have heard about the problem involved in SAVEing and



LOADing your own cassettes. The manual gives detailed instructions but many of the early ZX-81s would not accept tapes from some recorders. That problem is said to have been overcome but there can still be difficulties.

Usually they occur when LOADing tapes recorded by other people. One simple method to overcome this is to wind the tape to the middle of the program and type LOAD "" followed by NEWLINE; then increase the volume of the recorder slowly with the tape running until the television screen shows four or five thick black bands. If you then rewind the tape, the program should LOAD normally.

LOADing and SAVEing on the Spectrum is much easier and faster than the ZX-81. One difference is that when SAVEing on the Spectrum the LOAD lead must be disconnected either at the recorder or the Spectrum.

Finally, a health warning. Apart from any practical uses, computing with your Sinclair machine can be a very entertaining hobby and is almost certainly habit-forming. You may easily find yourself crouched over your machine, red-eyed, in the early hours of the morning thinking that in another five minutes you will solve the problem. Try to break that habit by getting into the fresh air and meeting other Sinclair users.

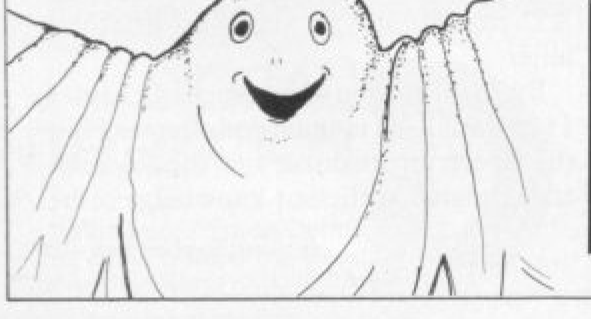
By obtaining a Sinclair computer you find that you have joined a not very exclusive club with many thousands of members, many of whom would be only too happy to advise you if you have difficulties.

Make sure of your regular copies of *Sinclair User* and *Sinclair Programs* and you can be guaranteed many happy hours.

ELEVEN-YEAR-OLD Neil Palmer of Barrow-in-Furness has sent us a number of programs for the 1K ZX-81, of which we are publishing two.

Ghost Chase is a chase program in which you must avoid a ghost and eat power pills—the asterisks. Use the cursor keys to move round the screen. The strange symbol in Line 140 can be obtained by pressing SHIFT 9 and then SHIFT P.

ghost chase



```
<FJRb<
  20 LET A=0
  30 LET B=0
  40 LET C=20
  50 LET D=30
  60 LET E=INT (RND*10+1)*2
  70 LET F=INT (RND*15+1)*2
  80 LET A$=INKEY$
  90 LET A=A+(2 AND A<20 AND A$=
"6")-(2 AND A>0 AND A$="7")
 100 LET B=B+(2 AND B<30 AND A$=
"8")-(2 AND B>0 AND A$="5")
 110 LET C=C+(A>C)-(A<C)
 120 LET D=D+(B>D)-(B<D)
 130 CLS
 140 PRINT AT A,B;"C";AT C,D;"▓"
;AT E,F;"*"
 150 IF A=E AND B=F THEN GOTO 18
0
 160 IF C=A AND B=D THEN GOTO 20
0
 170 GOTO 80
 180 LET S=S+1
 190 GOTO 60
 200 PRINT AT 0,0;"YOUR SCORE IS
";S
```

frogger

Our second program from Neil Palmer of Barrow-in-Furness is a 1K version of **Frogger** for the ZX-81. You must guide the frog across the road without being run over by the juggernauts. Use keys 5 and 8 to move left and right, and key 7 to go forward.



Variables

A variable is a location in memory where information can be stored. Usually the information will change as the program runs. To help you understand Frogger, here is a list of the variables used:

A$,B$: Hold the picture of the lorries.
A, B Hold the co-ordinates for the position of the frog.
C$ Holds the number of the key you pressed to move.
S Holds your score.

Program

10-60 Set up the picture on the screen and your starting position. INKEY$ is a command to read the keyboard and see if a key is being pressed.

70 Prints the picture on the screen. AT A, B; gets ready to print the frog at the proper place.

80 This complicated line reads information straight from the screen. It looks — PEEK — in the stores the computer sets aside for the screen and sees what is in there. In this case it is looking at the next place to PRINT AT, which will be the position of the frog. If the value of the character there is more than 127 — in this game it would then be part of a lorry — you have been run over and the program will STOP. You can find these values, called codes, in the back of the ZX-81 manual. This kind of PEEK command is a very useful way of checking where you are moving in an arcade game and saves a good deal of memory if you have only 1K.

100 Sends you to a special routine if you want to go forward.

110 Works out your new co-ordinate if you want to go sideways. You could do that with separate IF statements for left and right but Palmer has combined the two cleverly by using logic operations. The computer works out if the expressions C$="8", B<11 and the like are true and then if the whole expression with AND is true. If it is, the value of the bracketed expression is set to 1 and added or subtracted from the co-ordinate for right and left.

120 Prints the frog at the new position.

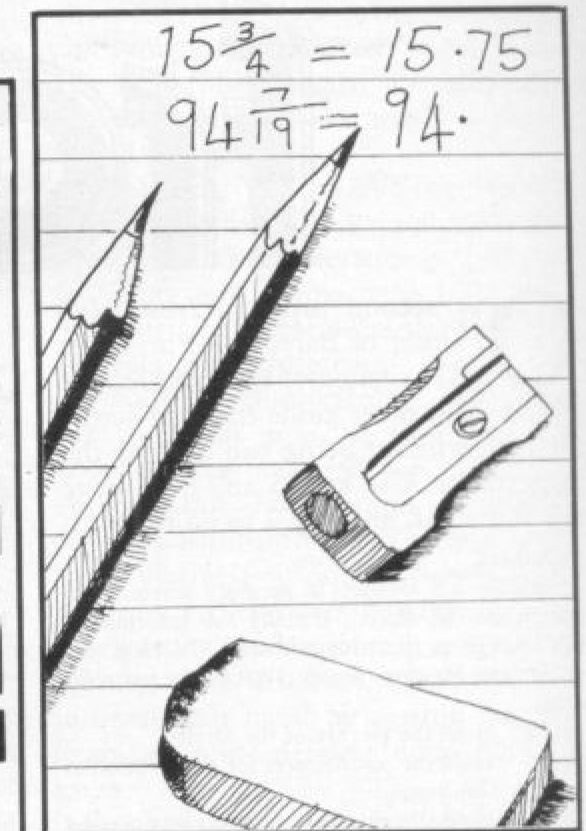
130-150 Work out the new picture by chopping off the front column and putting it on the other end; the program then returns to line 60 to start the routine again.

160-220 Let you move forward. Every time you go forward S is increased for your score and printed. If you win — 190-220 — the computer re-sets the starting position and begins again.

```
  10 LET A$="████    ███   "
  20 LET B$="    ███   ███"
  30 LET S=0
  40 LET A=9
  50 LET B=6
  60 LET C$=INKEY$
  70 PRINT AT 1,0;A$,,,B$,,,,A$
,,,,B$;AT A,B;
  80 IF PEEK (PEEK 16398+256*PEE
K 16399)>127 THEN STOP
  90 PRINT AT A,B;" "
 100 IF C$="7" THEN GOSUB 160
 110 LET B=B+(C$="8" AND B<11)-(
C$="5" AND B>0)
 120 PRINT AT A,B;"F"
 130 LET A$=A$(2 TO )+A$(1)
 140 LET B$=B$(12)+B$( TO 11)
 150 GOTO 60
 160 LET A=A-1
 170 LET S=S+(5)+(100 AND A=0)
 180 PRINT AT 12,0;S
 190 IF A>0 THEN RETURN
 200 LET A=9
 210 LET B=6
 220 RETURN
```

CONVERSION

```
   5 REM **** SCREEN SET UP ****
  10 PRINT AT 9,0; FLASH 1; BRIG
HT 1;"
                    CONVERSIONS
     "
  20 PAUSE 0: CLS
  30 PRINT AT 2,3;"Enter choice
(a-p)"
  40 PRINT "  a)Inches -> M.M.
             b)M.M.   -> Inches
             c)Feet   -> Metres
             d)Metres -> Feet
             e)Yards  -> Metres
             f)Metres -> Yards
             g)Miles  -> K.M.
             h)K.M.   -> Miles
             i)Pints  -> Litres
             j)Litres -> Pints
             k)Gals.  -> Litres
             l)Litres -> Gals.
             m)Ounces -> Grams
             n)Grams  -> Ounces
             o)Pound  -> K'gms
             p)K'gms  -> Pounds
"
  50 INPUT c$
  60 LET e$="Enter number of ":
LET d$="Do you want to repeat or
      calculate different conve
rsions (R/D)?"
  70 REM **********************
  80 REM *****CALCULASIONS*****
  90 REM **********************
 100 FOR n=1 TO 16
 110 READ x$,z$,w$,h
 120 IF c$=x$ THEN  CLS : PRINT
AT 10,0;e$;z$: INPUT y: LET a=y*
h: PRINT y;" ";z$;" = ";a;" ";w$
 130 NEXT n
 140 PAUSE 0: RUN 30
 150 REM **********************
 160 REM *********DATA*********
 170 REM **********************
 180 DATA "a","Inches","MM",25.4
 190 DATA "b","MM","Inches",0.03
93
 200 DATA "c","Feet","Metres",0.
305
 210 DATA "d","Metres","Feet",3.
281
 220 DATA "e","Yards","Metres",0
.914
 230 DATA "f","Metres","Yards",1
.094
 240 DATA "g","Miles","KM",1.609
 250 DATA "h","KM","Miles",0.621
 260 DATA "i","Pints","Litres",0
.568
```



PHILIP BAYLISS of Norwich sent a useful program for the 16K Spectrum. **Conversions** performs calculations to convert imperial to metric measurements and offers a choice of 16 conversions. It is a good example of how to use the READ and DATA statements simply and effectively, a problem often encountered by novices. In the DATA statements you will find the values required to obtain the second measurement from the first. As information stored in DATA statements is easy to see, it is a simple matter to alter them to include your own conversions, if you want to. Remember to change line 40 as well which prints a list of your options. Programmers often call this sort of list a menu.

```
 270 DATA "j","Litres","Pints",1
.76
 280 DATA "k","Gals","Litres",4.
55
 290 DATA "l","Litres","Gals",0.
22
 300 DATA "m","Ounces","Grams",2
8.35
 310 DATA "n","Grams","Ounces",0
.035
 320 DATA "o","Pounds","K'gms",0
.454
 330 DATA "p","K'gms","Pounds",2
.205
```

Trapping the errors will ensure first-time running

THE FIRST error code encountered by most Sinclair users is the flashing "S" on the ZX-81 or "?" on the Spectrum, which indicates a syntax error in a sentence. Experience and the manual soon show that it is caused usually by typing-in a keyword letter by letter, or by bad punctuation, for example omitting a semi-colon or an inverted comma.

The most frequently-occurring error code is "2" — variable not found. A variable is a letter which has been given a numeric value. When you enter "LET a=2" you are defining a variable. Error code 2 results when the computer reaches a variable in the program to which you have so far given no value.

Check the line which the computer specifies. If it is your program, give a value to the variable or remove it. If you are copying the program, look back in the listing to see which line you have missed.

Although the majority of error codes are explained adequately in the manuals, the report "B-Integer out of range" can be confusing. An integer is a whole number — 1 is an integer, 1.5 and 1½ are not. That code occurs most frequently when you try to print something beyond the limits of the screen.

PRINT AT 0,31; "a" is acceptable and will print a letter "a" at the top right of the screen. PRINT AT 0,32; "a" would not be possible. The integer 32 would be out of range, resulting in error code "B". That would also happen if the computer were instructed to PRINT AT 0,31;"ab". It would still be trying to print a character beyond the limits of the screen.

That error is more difficult to detect if variables have been used as co-ordinates and your character, or series of characters, is being printed in varying positions. If the instruction PRINT AT 0,x;"a" produces report code B, make sure that the value of x never increases beyond 31.

On the Spectrum "B-integer out of range" is also often found when you are POKEing-in user defined graphics. The biggest number which can be POKEd-in this case is 255 or BIN 11111111. In that case the error code will occur in the line containing the POKE statement. In most cases, though, the error will have occurred in one of the DATA lines in the program.

A very frequent error code produced on the Spectrum is "E-Out Of Data". That will occur in a line containing a READ statement. The error code, though, will have occurred in one of the program DATA lines, which may be nowhere near the READ line. A READ command sends the computer to a DATA line to collect the next piece of DATA contained there. That is often done using a FOR, NEXT loop, especially when graphics are being set up.

FOR n=1 TO 8: READ n will send the computer to the DATA lines eight times, for eight separate pieces of information. If there are only seven pieces of DATA there it will return to the READ line and produce the code OUT OF DATA. When there are several DATA lines they will all have to be checked, because the piece of DATA you have omitted was not necessarily the last.

In some cases the computer will follow the program correctly, without producing an error code, but from the programmer's point of view the program contains an error. In that case BREAK into the program at the moment it goes wrong. That will produce report code 9 and the line on which you have STOPped the program. That method makes it easy to locate the area of the program which contains the error.

Programs which you copy from magazines, books or from friends can be difficult to error-trap because they contain programming techniques which you have not yet learned, or simply because it is often difficult to follow another programmer's logic.

The flashing "S" or "?" indicating a syntax error may appear frequently. In that case check carefully what you have copied. You may not have recognised words such as LN or EXP as keywords.

On the ZX-81 especially it is easy to forget that pressing "π" will produce the word PI.

Make sure that when the "is not equal" sign, "<>" appears in a listing you always enter it as one character and not as "is less than", "<" followed by "is greater than", ">".

Technical problems can also cause errors in programs. Any alteration to the power supply can cause a program to CRASH. In that case the screen display may change dramatically and using the keyboard will have no effect. The only solution is to unplug your computer and begin again, making sure that your power supply and RAM pack are both connected firmly. That error is caused by the computer and not by the program.

> 'The error need not be on the line which produces the report; that is simply the line where the computer meets the problem'

Sometimes a program listing in a book or magazine will contain what seems to be a very obvious error. If it contains key words or symbols which are not on your computer, check that it is intended for your machine. Programs for the Spectrum, the ZX-81 and the ZX-80 are not usually directly interchangeable. If a program contains the command GOTO or GOSUB — a non-existent line number — the computer will simply go to the next numbered line after that one. That is a sign that a program has been developed and improved and is rarely an error.

When you have errors in a program, first check the report codes listed in Appendix B of the manual. It may then be necessary to read the appropriate section of the manual. Remember that the error is not necessarily on the line which produces the report code; that is simply the line where the computer meets the problem for the first time.

Always check carefully every line connected with the line containing the error code and the mistake should be easy to locate.

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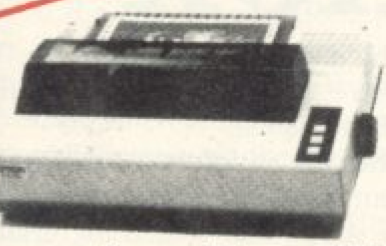
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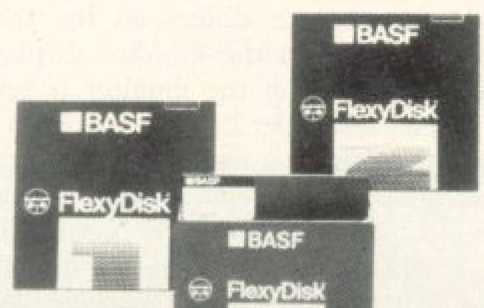
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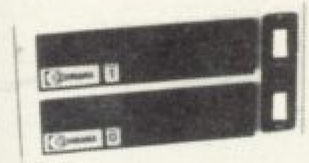
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John Gilbert draws on his extensive hands-on experience to answer the basic questions surrounding the new Sinclair machine

The QL: separating fact from fiction

THE SINCLAIR QL has finally landed in the *Sinclair User* offices so that we can offer one of the first reviews on the machine. Despite the external EPROM containing part of the operating system which hung out of the back and bounced round when the keyboard was used, and the almost non-existent manual, the machine was up to the standard which is going to customers.

It arrives in a box three times the size of the Spectrum which contains the manual, external EPROM and free RS-232 lead.

Although the machine is not particularly attractive, the keyboard works better than it looks, even if the keys, especially the space bar, had an irritating clacking sound when pressed.

When first powered-up the computer will ask the user to press either function key one — F1 — if using a monitor, or F2 for an ordinary UHF television set.

There are five function keys which can be utilised in either SuperBasic or machine code for complex tasks performed by the user. For instance, it is possible to call several procedures into operation, such as clearing all areas of the screen at once, by pressing one of the function keys.

Unfortunately new computer users may have some difficulty getting to grips with entering programs because the television screen display is different and less easily understandable than that of a monitor.

On the monitor the QL initially splits the screen into two windows, or pages, one white and one red. The white is used for program listing and the red for the results of a program, such as graphics or input.

The monitor display separates those windows but the television super-imposes one on top of the other, the white listing window being the primary one.

As the windows act as two separate screens, you need two separate instructions to CLS them. The CLS 2 clears the listing screen and CLS clears the program results window. Every time the QL finishes a program you will have to perform a CLS 2 to put the listing on to the screen. It would have been better for the QL to switch back automatically to the listing window when a program has finished and list the SuperBasic code.

The size of the characters displayed on a screen differs on the television display and the monitor display. The resolution of the monitor is set at 80 characters per line but is coarser on the television setting. It is, however, possible to get 80 columns on the television set using the MODE command which will define the resolution in which the screen is displayed. Sinclair seems to have overcome its difficulties with colour displays on television sets and 80 columns is just about readable.

The program editor will alter and add to your lines of SuperBasic program in much the same way as the Spectrum, with one important difference. If you type in a line which has an error the computer will tell you about the error and promptly forget the line. You will have to re-type the line with corrections.

If you want to edit a line which you have already entered on the listing screen you must type EDIT, followed by the line number. The only reason you might want to do that is if you want to alter a line which contains an error other than syntax.

Error-checking, using the program editor, may be almost non-existent, but Sinclair seems to have learned by its mistakes with the Spectrum so far as error-checking and correcting while a program is running is concerned.

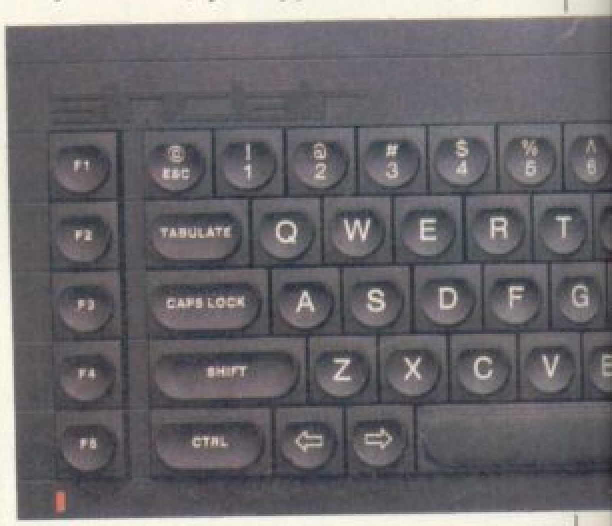
Apart from the SuperBasic commands which trap errors, the machine will also allow you to use any variable, numeric or character, without first defining it. If you ask for the contents of an undefined variable, the QL will put an asterisk into it. Error-trapping is essential on a machine like the QL and Sinclair seems at least to have that correct.

The way in which SuperBasic and QDOS are implemented with the 16-bit M68008 is an incredible bodge which makes the machine less expensive to manufacture than if it had the full power of the 68000.

The chip has an internal structure of 32 bits but the slow speed at which the QL runs shows that something drastic has been done to the microprocessor. When you look at the specifications everything seems rosy until you learn that the machine supports only an 8-bit databus.

As a result of the chip mutation, and after running several benchtests on the BBC Micro, Commodore 64 and Spectrum, it was found that the QL was slower than all those machines, including the Spectrum, if you type in a benchtest of only a few lines.

If, however, you type in a long pro-



gram you will find that the computer does not react any more slowly but that its competitors, such as the BBC, do. It runs at about the same speed while interpreting long and short listings.

Multi-tasking, especially when used in connection with SuperBasic, is a misapplied term. What can you do in SuperBasic is to run a program while at the same time accessing a peripheral such as a Microdrive to load or save data.

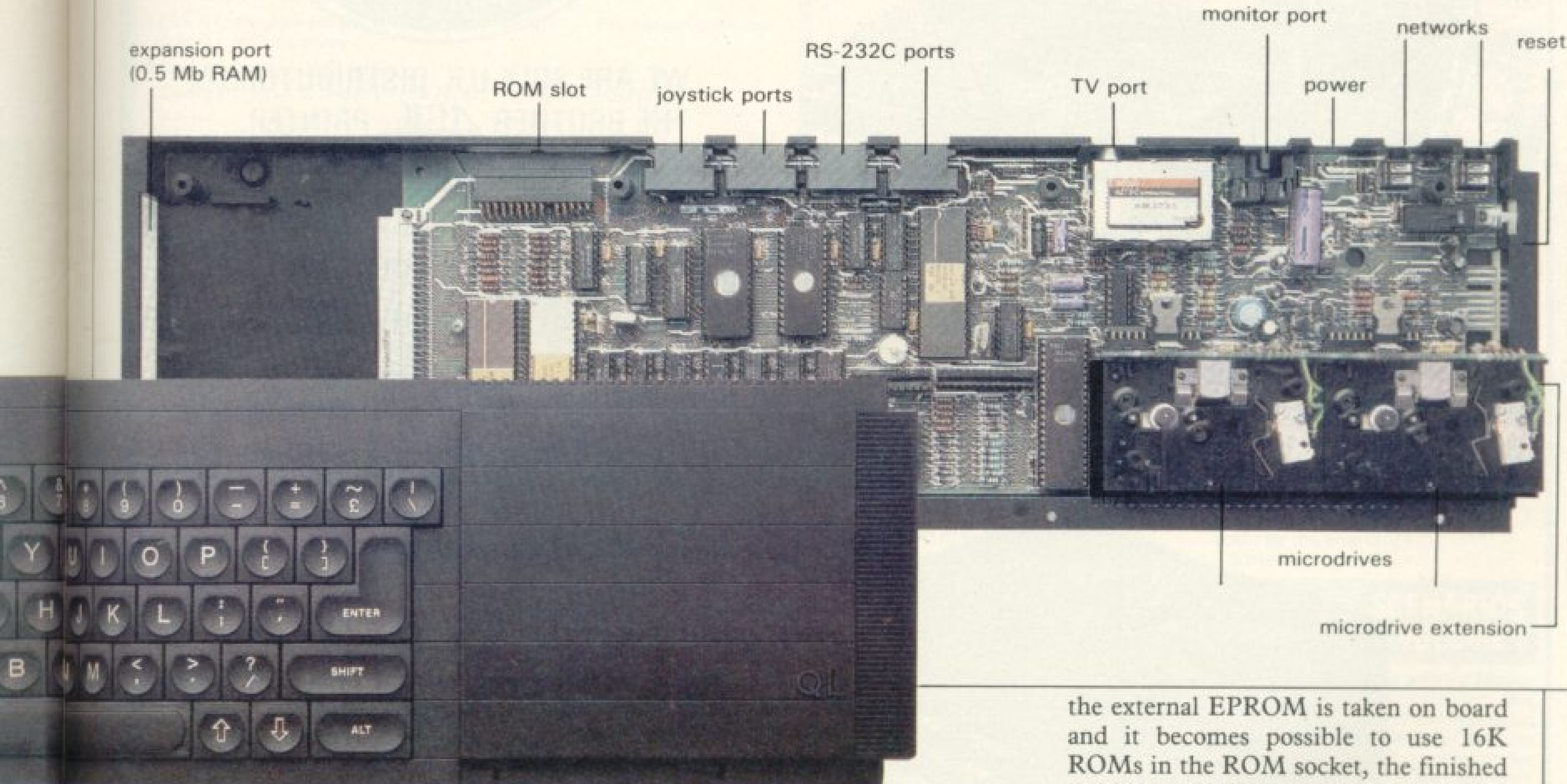
It is not possible to run two or more SuperBasic programs at the same time on the QL and so you cannot have Basic multi-tasking. It is, however, possible to run several machine code routines concurrently.

Despite disappointments with multi-tasking, the graphics created using Su-

perBasic can be spectacular and are as fast, if not faster, than those of the BBC micro.

There are two circle commands on the machine, one called ELLIPSE and the other CIRCLE. The latter seems to have been left in by mistake, as it is part of the pre-production operating system and does the same thing as ELLIPSE.

The ELLIPSE command is similar to that of the Spectrum CIRCLE. It allows the user to produce arcs, circles and even lines. There is also a LINE command which uses absolute co-ordinates on the screen, unlike the Spectrum, which uses relative plotting.



QL graphics are easier to use than those of the Spectrum, because each pixel can be referred to absolutely. You do not have to re-set the plot position every time you start a new line as you do with the Spectrum.

Turtle graphics seem to have been an afterthought on the part of Sinclair. Unfortunately, they seem to have been hastily implemented and, on our machine, we were not always sure that they would work in the way we intended.

The QL starts on the wrong foot by having the turtle pen up, in the non-draw mode, when initialised. To draw a line you have to type PENDOWN and even then the QL will show no sign that the turtle is in operation.

Unfortunately, the Microdrives are not up to their best with MERGE. The only Microdrive instruction which provokes anything like the response rate promised by Sinclair is the DIRectory, formerly the CATalogue, command where the names of the files on the 100K Microdrive cartridges are displayed. The Microdrive takes approximately three seconds to display the contents of a cartridge.

The access time for Microdrives on the QL is disastrous for the businessman. Quill, for instance, takes two minutes to load. They are, therefore, only slightly faster than a cassette recorder using the baud rate of a Spectrum to load a 48K program.

The response rate of Microdrives under the QL QDOS operating system may be slow but it becomes even slower when you enter the operating systems of one of the Psion software packages. Files can take so long to load into the programs that you might wonder whether the machine has crashed in desperation.

Microdrives are hopelessly inadequate for the business community and, because of the temperamental nature of operation, could pose a serious risk to data stored on cartridge. It is all very well for Sinclair to suggest that you make back-up copies of all your files, as irretrievable errors can be made during the back-up procedure with your only copy of data in the drive.

The serial interfaces on the QL are also hopeless for the intended Sinclair business market. Apart from the RS232 being slow, the business community does not regard it as standard, favouring Centronics instead, and so for business users the choice is, at the moment, whether to buy a QL in the hope of getting a Centronics interface or not to buy a QL at all.

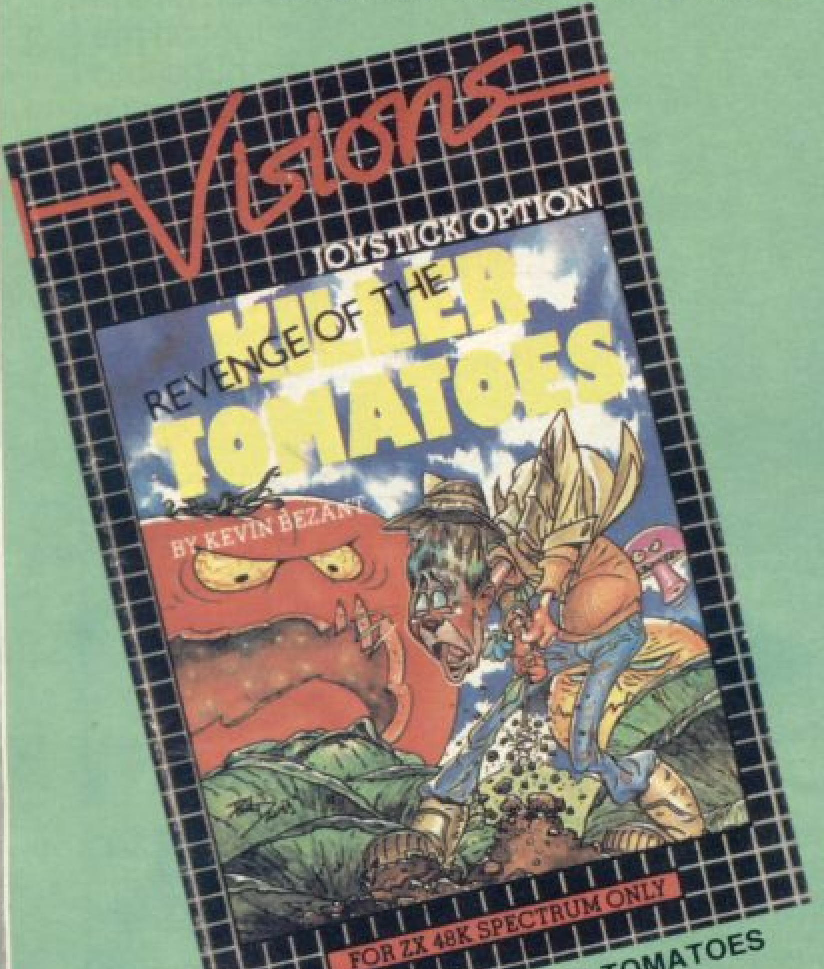
Despite the inadequate or non-existent nature of the QL peripherals, the main PCB of the machine is attractive and well put together. The hardware designers should be complimented on the compromises they have taken to make the machine operational. When the external EPROM is taken on board and it becomes possible to use 16K ROMs in the ROM socket, the finished machine will be a serious contender against the PCs and Apricots at the upper end of the market.

It is inadvisable for every businessman to order one but Sinclair should aim the machine at the serious home user and student. For the business user the machine seems inadequate and slow by most 16-bit computer standards. It costs, however, only £399 and represents a considerable achievement for Sinclair Research.

The company may have exaggerated the brilliance of the machine and mismanaged the marketing yet again, but it nevertheless has a winner on its hands. It has also broken through to the serious, upper end of the market. So long as it receives the software support the new Sinclair baby should make almost as big an impression as the Spectrum.

ALL THE

Here's a sure-fire way of making certain 1984 is packed full of fun for you and your friends. We've searched for brilliant new program sources throughout the U.K. and North America to find an exciting collection of new games—and business programs—many of which cannot be bought by mail order from any other source! These are our latest exclusive offerings.

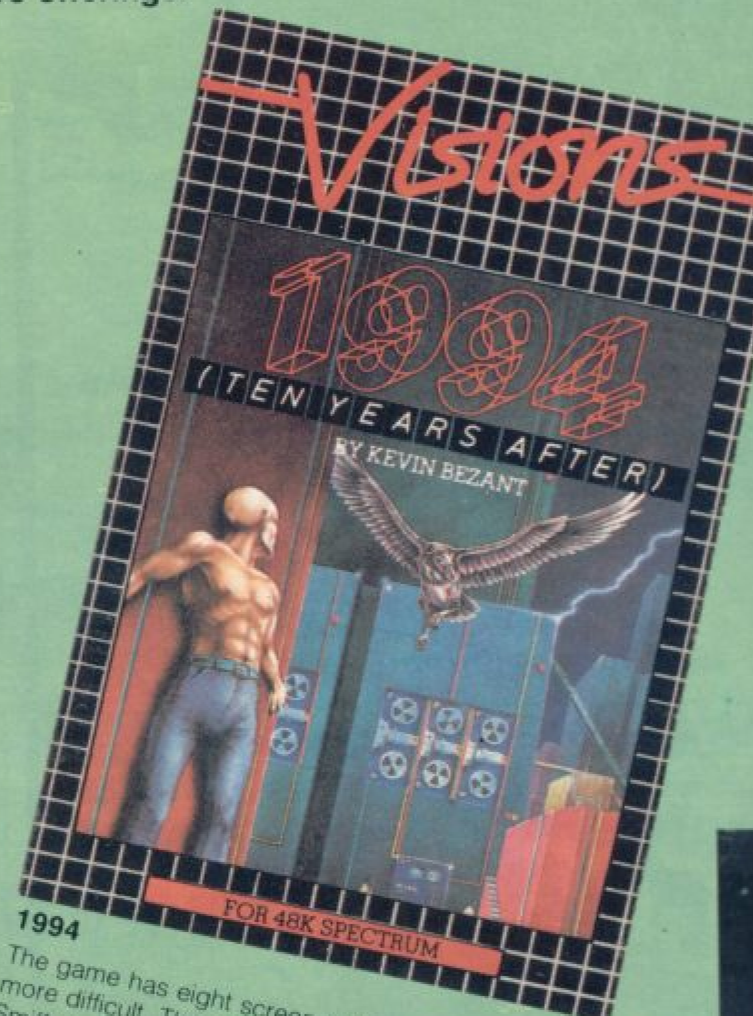


REVENGE OF THE KILLER TOMATOES

Gardeners' Question Time never faced these problems! You are faced with killer tomatoes, manic mushrooms and psycho swedes chasing you through the cabbage patch as you try desperately to earn a daily crust as a gardener. You are the meat about to be devoured by the two veg. Can you survive? Tremendous after dinner fun. Spectrum 48K.

Cassette price: £5.95

Ref. No: 2-61



1994

The game has eight screens which get progressively more difficult. The object of the game is to take Smiffy from Screen 1 to Screen 8 and to get to and from each screen you must pick up the key which lies within the screen that will open the exit door. The hazards include stepping onto and off, up and down lifts going over droids and avoiding plasma bolts that are constantly being fired at you. For the Spectrum 48K.

Cassette price: £6.95

Ref. No: 2-56

FREE BLANK C15 COMPUTER CASSETTE WITH EVERY TWO CASSETTES YOU ORDER!

Remember there's no limit to the number of free cassettes you receive if your order justifies them — so why not get together with friends or user group members and share the freebies?

GREAT VALUE! TREMENDOUS SELECTION! PLUS A FREE OFFER EVERY TIME!

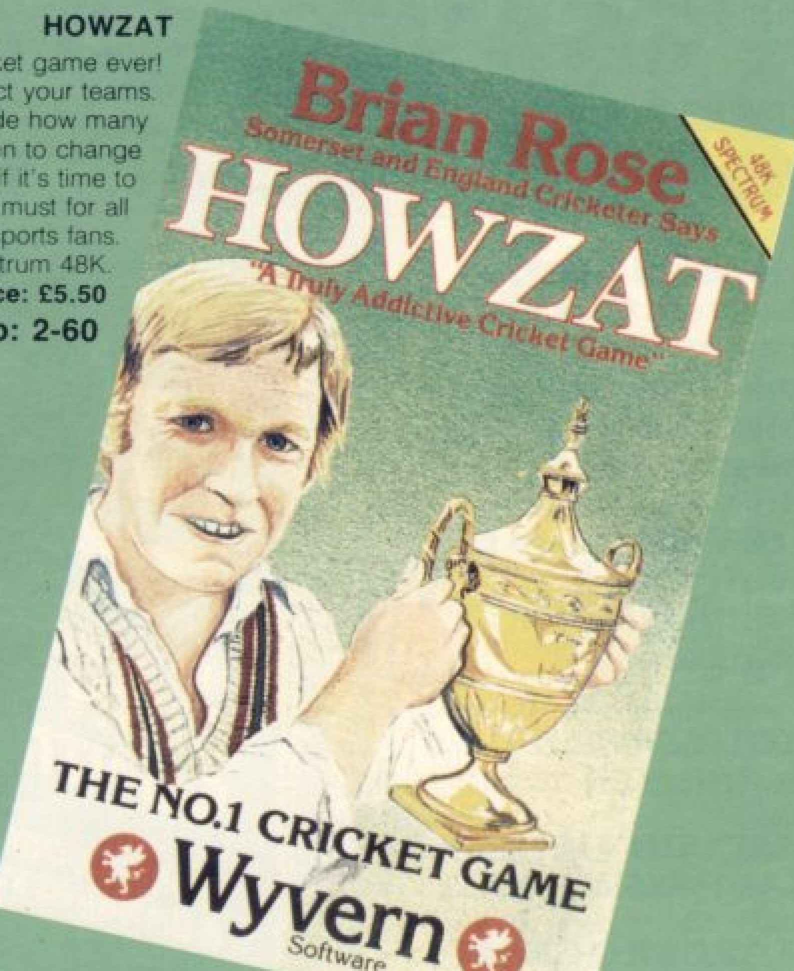
Fill in the order form right away — we're guaranteeing fast delivery, quality and satisfaction [after all, we want you to come back for more!]

The Software Workshop, Yew Tree, Selborne, Hants GU34 3JP

WINNERS

HOWZAT

The greatest cricket game ever! Decide who bats. Select your teams. Change the field. Decide how many runs to take . . . . . when to change the bowling . . . . . if it's time to declare. Addictive fun! A must for all sports fans.
Spectrum 48K.
Cassette price: £5.50
Ref. No: 2-60





BATTLE 1917
Winner of the 1983 Cambridge Awards sponsored by Sinclair User. The game is played by two players on a board 21×32 showing a map which changes with every game. Each player has 29 pieces including infantry, cavalry, tanks, artillery and a King. The object of the game, like chess, is to kill the enemy King. The game will appeal equally to all ages and all skills. This is the computer age's answer to Chess.
Cassette price: £6.00
Ref. No: 2-57

UARANTEE
complete confidence. If you are
ely satisfied with the quality of
chase return it to us within 7
we will provide a replacement.

And here's a further selection of the latest games, the best value software for your Spectrum

Spectrum Software

2-13 **Sentinel**
Guard you mother ship against alien attacks. 48K RAM — **£4.95**

2-14 **Meteor Storm**
Spectrum version of the ever-popular arcade game. 16K or 48K RAM — **£4.95**

2-15 **Star Trek**
Popular space program brought to life by excellent graphics. 48K RAM — **£4.95**

2-21 **Frogger**
Manoeuvre the frog across the road avoiding heavy traffic. 48K RAM — **£5.95**

2-23 **Arcadia**
The expert's version of the popular invaders' game. 16K or 48K RAM — **£5.95**

2-24 **Golf**
The finest of golf handicap games. 48K RAM — **£5.95**

2-26 **Derby Day**
This favourite has to be a winner. 48K RAM — **£5.95**

2-53 **Snooker**
For all budding world champions. 16K RAM — **£8.95**

2-54 **Flight Simulation**
On the top 20 for months. Test your skills as a pilot. 48K RAM — **£7.95**

2-55 **Arcturus**
A great logic game. At first you'll think it's impossible to win! 48K RAM — **£5.95**

To: The Software Workshop, Yew Tree, Selborne, Hants GU34 3JP

I wish to order the following programs. I understand that:

* I will receive a FREE blank cassette with every 2 programs ordered
* I can return products within seven days if not entirely satisfied and receive a replacement.

Ref No	Qty	Title	Price

Postage, packing and handling: add 45p for the first cassette, and 25p for each additional cassette. Non-UK orders add extra 50%

Total ______

I enclose a cheque/postal order for ______

Name ______

Address ______

______



(Allow 28 days MAXIMUM FOR DELIVERY)

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A professional style multi function Cash Controller program that can load and make an entry in just 90 SECONDS . . . thanks to its ZX MICRODRIVE COMPATIBILITY. If you're not ready to upgrade to Microdrive yet, this easy to use cassette program can handle up to 400 transactions with your Spectrum, almost filling the 48K memory of your computer.



BANK ACCOUNT

- Statements on demand from any date to date.
- Holds up to 400 transactions.
- Standing order facility.
- All transactions can be automatically coded to allocate up to 16 budget headings.
- Search facility for any single item by description or amount.

HOME BUDGETING

- 16 budget headings, e.g. Gas, Rates, Car, Tax - you can choose the headings
- Highlights under/over spending
- Full budget expenditure breakdown
- Budget "re-think" facility

LOAN/MORTGAGE CALCULATOR

All you ever wanted to know but didn't like to ask! Calculates:

- **Interest rates**
- **Payback periods**
- **Capital sum**
- **Period of loan**

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- **FULL SECURITY WITH PERSONAL PASSWORD**
- **FULL SAVE PROGRAM ONTO CASSETTE OR MICRODRIVE**

Available from good computer stores or direct by mail order... **at a price that won't upset the Bank Manager!**



FIRST FOR MICRODRIVE

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PRIORITY MAIL ORDER

Please send me ________ CASH CONTROLLERS at £9.95 each including post & packing (overseas orders add £1.50).

Name ________

Address ________

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Or credit my Access/VISA Card Number

Signature ________

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SINCLAIR BUSINESS USER

July 1984

Contents

On this page business users exchange news and views; overleaf we present a comparison of payroll programs.

On page 120 we feature our first Business User of the Month.

High risks with serious software

AS ORIGINATORS of the Small Business Accounts program reviewed by Mike Wright in the May issue of *Sinclair User,* we feel qualified to comment on the letters in the same issue concerning the lack of serious software.

Whereas every owner of a Sinclair machine is a potential buyer of games programs, business use is a very much restricted market; costs of packaging, instruction booklets and advertising are very much the same, so the risks are that much higher.

Your correspondent W C Carey refers to the business software provided for the HP/Commodore/Apple/IBM machines. Examine a catalogue and it will be found that those programs sell for many hundreds of pounds. We have just completed a payroll program for the Spectrum but know that customers do not yet fully appreciate how much time and effort such programs can save and that lack of general interest has to be reflected by a low price.

In our experience the writing of the program is the simplest part of the operation; adjusting it to cater for the wide variety of possible users and trying to anticipate individual requirements requires not only good programming capability but also a long experience of the subject matter, two features which occur infrequently in the same individual.

The Spectrum and later the QL users will form the bulk of the business users of the future; to that end the business user column of your excellent publication performs a most valuable service.

D A Pain,
Willden Software,
Crowborough, E Sussex.

Light pen for corner shops?

I WONDER if any readers could advise me of someone who can produce a fairly cheap light pen with hardware to read UPC bar codes on groceries? The big chain stores are developing laser readers for their checkout desks but, with a simple light pen and a reader, even the smallest corner shop could benefit from the pricing and stock control of UPC codes.

One of the Sinclair stock control programs could be adapted very simply with the proper hardware.

Robert Skillicorn,
Tan y Weirglodd,
Clwt y Bont,
Caernarfon, Gwynedd.

Misleading Vu-Calc

I WROTE to Sinclair and Psion Ltd by recorded delivery expressing disappointment with Vu-Calc. My version is different from the program illustrated on the cassette inlay, which clearly shows capacity for eight characters across a vertical column, as well as the use of inverse characters and colour shading to emphasise headings.

The program runs out of working space very quickly in 48K and, at that point, no extra formula can be added even if originals are deleted.

I received no reply and I feel that other prospective customers may also be misled by the cassette illustration.

It is only fair to say that I sent copies of my letters to the retailer, Boots, which responded quickly by offering to refund the purchase price.

I am now using Omnicalc by Microsphere and it is much better, as indicated by your useful Gilbert Factor.

Michael Dagnall,
Bishop's Stortford,
Herts.

Post Office programs

I SHOULD be interested to hear from anyone who has a program for sub-post office work. I have a Spectrum 48K with Interface One and Microdrive.

Phillip Glithro,
Gilling Road Post Office,
Richmond, Yorkshire.

Having difficulty with transactions

YOUR REVIEW in the May issue of Richard Shepherd's Cash Controller fails to mention two points which I find detract from its usefulness.

Having loaded the program and entered a number of transactions, the program eventually crashed. That proved to be because I had entered 201 transactions and the dimensions of the program, revealed when I listed the Basic, are set to cope with only 200, not 400 as claimed in the advertisement and the instructions. Re-setting the dimensions to 400 causes the program to go out of memory.

As that capacity copes only with two to three months' entries for my current account, I will have to clear out all the transactions three to four times a year. To make things worse, when the option to clear transactions but hold the balance is used, it also cancels all standing orders, so that they have to be re-entered from scratch. The program is also very clumsy in coping with changes in standing orders. The order must be deleted and re-entered with its new value.

M J Grocott,
Loughborough.

Practical solutions to taxing problems

Mike Wright recommends some of the payroll programs on the market but not without reservations

THE APRIL Budget again made extra work for every business in the country, with changes to personal allowances and National Insurance contributions. So it seems appropriate to examine some of the payroll programs available. Programs were received from Byte One, Hilderbay, Transform and V & H Computer Services. The program marketed by Transform is Byte One. Comments regarding the Transform program should also be taken as applying to the Byte One program.

In the programs reviewed two different approaches are used. The Transform program is a once-and-for-all program in which the user sets the payroll variables such as National Insurance percentages, earnings levels and tax rates, while Hilderbay and V & H Computer Services include that data in the program. Consequently changes in tax or NI rates mean that updates must be obtained before the new rates can be implemented. V & H Computer Services offers an annual maintenance contract at £5.75 which provides free updates whenever necessary. Hilderbay offers updates at £3 each.

The V & H program, which is also available for the 16K ZX-81, supports all tax codes and even incorporates a system of error-trapping which tries to interpret incorrect codes. Only not contracted out NI contributions are supported. Employees can be paid on an hourly or weekly basis but not monthly and there is no provision for superannuation schemes.

```
BLUEBOTTLE BREWERY

SEAGOON N                Tax wk.7
Tax code                 200L
NI No.                   AG123456
Date                     10.06.84
NORMAL TIME                 68.64
O/T (1)
O/T (2)                     21.45
O/T (3)
SICK                        22.88
HOLIDAY                      8.00
ADJ.

GROSS                      120.97

TAX                         -5.96
N.I.                        10.87

                        ---------
PAYABLE                    116.06

NI. (emper)                 13.83
Gross to date              873.81
Tax to date                180.90
```

V & H Computer Services

The program is run from a main menu of six options. On first loading only one, Set up new payroll is operative. That leads to a question-and-answer session, with the user giving details of the company and then each employee in turn. Once the initial details are set up, the payroll can be run. That gives a menu of options which include specifying either the number of hours worked or the normal week.

Three options allow overtime to be entered at time-and-a-quarter — $T+\frac{1}{4}$ — $T+\frac{1}{2}$ or 2T. Other rates for overtime are not possible to enter directly but could be entered under the pre-tax adjustment facility. Post-tax changes can also be made. Pre-tax changes are taken to be additions and post-tax changes are deductions unless prefixed by a minus sign. Both the number of hours of sick pay and holiday pay can also be entered. Sick pay is calculated at the hourly rate and holiday pay at £1 per hour.

'The Transform program made some errors in calculation'

Once all employees' pay has been calculated the program leads the user automatically through printing a summary of all pay before saving the program and data for the next run.

The Hilderbay program operates in a different way. There is a fixed main program with a secondary data set which contains the tax and NI information. The review copy, received before the Budget, contained only the tax and NI changes to August 1, 1983. That did not affect the operation of the program, although it would not cope with pension contributions which attract NI but not tax. That has been incorporated in later versions. Hourly or monthly pay can be handled, although not at the same time. All types of class one NI contributions are handled but are referred to as 1-5 rather than A-E. In addition, a zero option is offered for those who pay no NI contributions. All tax codes including F, D, BR and NT are supported.

```
SEAGOON N
Tax code: 200L

At end of Week 7

Tot.gross  to date = £873.81
Tot. tax   to date = £180.9

For Week 7:
24 hours @ £2.86/h
Gross Weekly pay =  £68.64
Pre-tax change =   +£52.33
                   ========
            Total = £120.97 (A)

Tax             = £-35.76
Employee N.I.   = £10.88
                  ========
          Total = £-24.88 (B)

Additions after tax = £0 (C)

Net pay = A-B+C = £145.85
```

Hilderbay

The program is controlled from a master menu which offers six options, three of which are concerned with loading, saving and installation details. A fourth option allows the week or month to be set at the start of a run. Program operation is reminiscent of a database, with each employee acting as a record with fields containing pay, tax and NI information as well as other options. Changes are made to the fields by a single keystroke to select the field before entering the new data.

Unlike the other programs, individual details of overtime, sick pay, holiday pay are not catered for, but a total figure for 'pre-tax changes' is entered instead. Post-tax changes can also be included. A coin analysis is provided as an option in the program to give a breakdown of the numbers and types of coins needed to pay employees.

Only one payslip is printed per employee and the summary totals for each employee and the whole company are printed under a separate option. An option is provided for printing text and although initially it was awkward to use, to print extra text on a payslip it is a useful aid.

The Transform program is menu-driven and leads the user step by step through setting up the initial data to using the program. The response to be made to a prompt is often omitted, leaving the user to find it by trial and error. There are options allowing for employees to be paid weekly, hourly or monthly. Separate runs must be made

for weekly, hourly or monthly-paid employees. Further entries can be made for overtime, holiday and sick pay and commission. Provision is also made for other additional pay and deductions either before or after tax.

National Insurance contributions for contracted out and not contracted out are calculated by the program. Of the five NI contribution classes, A, B, C, D and E, only four — either A, B, C, D or

```
BLUEBOTTLE BRE        PAYSLIP

SEAGOON N
STAFF NO.23451

WEEK 7
04/06/84 TO 10/06/84

BASIC WAGE            £68.63
OVERTIME              £21.45
SICK PAY              £22.88
HOLIDAY PAY           £7.99

GROSS PAY             £120.95

NATIONAL INS.         £10.88
TAX REBATE            £8.26

NETT PAY              £118.33

TOTAL GROSS PAY       £873.79
TOTAL TAX             £176.6
TOTAL NETT PAY        £612.06


____________________byte one______
WEEK NO. 7
04/06/84 TO 10/06/84

WEEKS' TOTALS

WEEKS TOT. GR. PAY     £120.95
WEEKS EMPLOYER N.I.    £13.84
WEEKS EMPLOYEE N.I.    £10.88
WEEKS TOTAL N.I.       £24.72
WEEKS NON-TAX' PAY     £0
WEEKS COMMISSION PAY   £0
WEEKS SICK PAY         £22.88
WEEKS SUPERANNUATION   £0
WEEKS TOTAL TAX        £-8.26
WEEKS TOT. NETT PAY    £118.33

YEARS TOTALS SO FAR

YEARS TOT. GR. PAY     £120.95
YEARS EMPLOYER N.I.    £13.84
YEARS EMPLOYEE N.I.    £10.88
YEARS TOTAL N.I.       £24.72
YEARS NON-TAX' PAY     £0
YEARS COMMISSION PAY   £0
YEARS SICK PAY         £22.88
YEARS SUPERANNUATION   £0
YEARS TOTAL TAX        £-8.26
YEARS TOTAL NETT PAY   £118.33
```

Transform/Byte One

A, B, D, E — can be handled at one time. All the not contracted out rates are covered but the program in setting up the NI data for contracted out cases prompts only for the earnings limits and one set of percentages.

Superannuation schemes are also coped with, allowing for deductions to be made as a fixed payment based on a percentage of gross pay at a fixed date or as a fixed percentage of gross pay. Alternatively, the employer-paid scheme is also allowed for.

The manual claims that all tax codes are supported when it means all four-figure tax codes are supported. Codes D and NT are not supported and in the extreme possibilities of a person's allowances falling below £1,000 or rising above £10,000, codes H and L would not be supported. Additionally the program was tested using the latest Inland Revenue test data and found for week one an overpayment of 10 pence tax had been calculated.

Having a breakdown of some of the additional items, such as holiday and sick pay, is very useful, and although it assumes the overtime rate, or rates, is based directly on the hourly rate, it allows a multiplier to be specified. That permits the overtime rate which is not based on the hourly rate but which may be based on a national minimum rate to be expressed as a multiplier of the hourly rate used in the program.

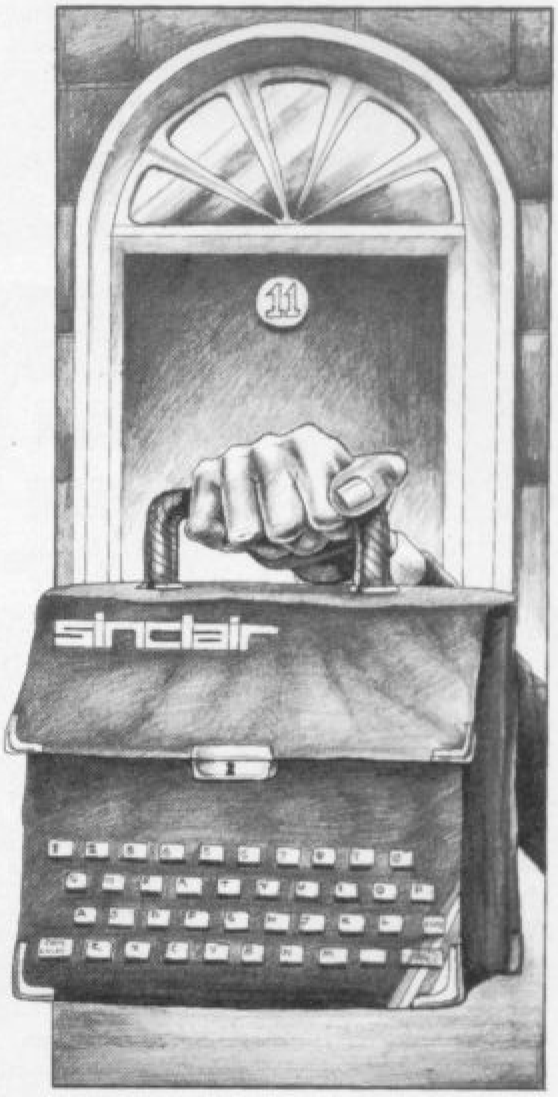
Other attractive features were the printing of two copies of the employee's pay slip as well as weekly/monthly and year-to-date totals automatically, and the way in which the user is made to save and verify data at the end of each week/month run.

All three packages have features to commend them in their operation — the once-and-for-all nature of the Transform package and its independent entry of sick and holiday pay as well as allowing for superannuation schemes; the Hilderbay completeness in covering all tax codes and types of NI contributions; and the V & H Computer Services coverage of all tax codes and the layout of the payslip.

Of the three manuals, none was of the quality in presentation or explanation which could be expected. The Transform manual is four pages of thin dot matrix printed paper, of which two pages are used to introduce the program and tell the user how to load it. The most helpful manual was probably that of V & H but even that was printed on a dot matrix printer without true descenders.

Another pet hate occurred on both the Hilderbay and Transform pay slips. It is the failure to print trailing zeros after a decimal point and also to line up amounts on the decimal point in a column of figures.

Obviously accuracy plays a vital role in any financial package and while both the Hilderbay and V & H programs performed well, the Transform program made some errors in calculation. Although the occasional penny difference in NI contributions may be acceptable, the same kind of difference in an employee's basic pay — i.e., number of hours worked×hourly rate — is not, and the Transform program is prone to make such errors. The choice of program depends on the payroll system and preferences of the user. While there are reservations on the limitations on overtime rates in the V & H program and the entering of any other pay apart from regular or hourly pay as one item in the Hilderbay program, they can still be recommended for business use.



Byte One, 69 West End Park Street, Glasgow G3 6LJ.
Hilderbay, 8-10 Parkway, London NW1 7AA.
Transform, 41 Keats House, Porchester Mead, Beckenham, Kent.
V & H Computer Services, Mayfield House, Spencer Street, Bognor Regis, West Sussex.

SUMMARY TABLE OF PAYROLL PROGRAMS

	Transform	Hilderbay	V & H Computing
Price	£19.95	£25	£14.50
Memory	' 48K	48K	48K (16K ZX-81)
No. of employees	40	50	200
Full tax codes	No	Yes	Yes
NI contributions			
Not contracted out	Yes	Yes	Yes
Contracted out	One rate only	Yes	No
Length of company name	14 chars.	n.a.	32 chars.
Length of employee name	14 chars.	21 chars.	15 chars.
Print user's text	No	Yes	No
Add or remove employees	Yes	Yes	Yes
Coin analysis	No	Yes	Yes — separate program

A systematic start

John Heritage relates how he took his first faltering steps to computerise a business.

AS GENERAL MANAGER of a small engineering company specialising in the design and manufacture of vibratory equipment, my main job is to design our special equipment and we have recently set up a small computer in our engineering department.

A number of years ago the company commissioned a university for a design study which enables us to determine the position and predict the maximum level of stress in the machine, the most likely cause of a failure.

A computer was suggested and discussions with the university led me to the small 'business' machines — Apple, Pet, and the like — but no software to carry out our stressing calculations appeared to exist. The cost of the equipment and having the program written for us appeared to be prohibitive but I concluded that if we could use a computer to store our Job File information as well, it might make the project all the more viable.

The idea remained dormant for some time until a ZX-81 was bought in mid-January, 1983 as a family present.

The stressing calculations program was started first and initially the program was not too difficult. Senior members of the sadly now defunct Ashford Computer Club were helpful and suggested various methods.

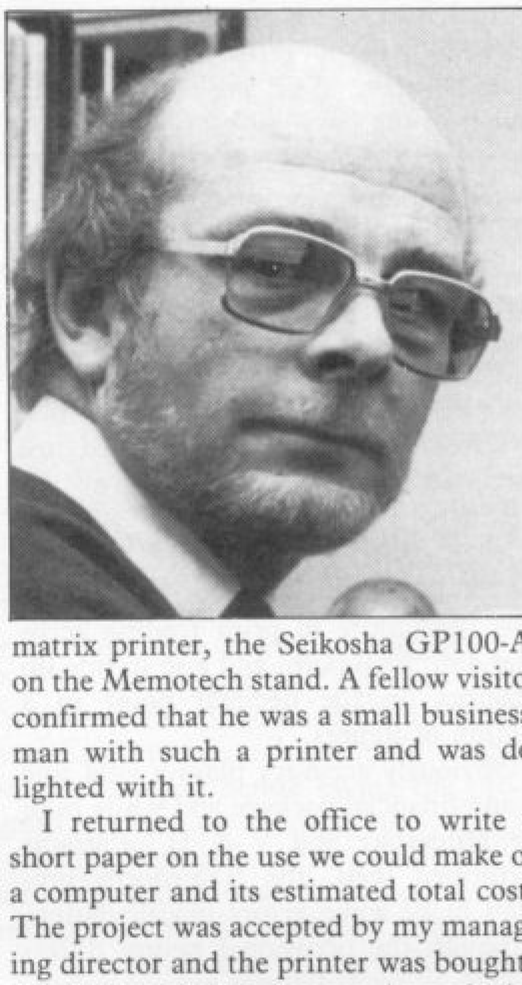
I spent several months of evenings, and early mornings, too, perfecting my program. The final screen display read "PRESS L PRINT (Shifted "S") to obtain a printout." Would you believe I did not have a printer at that stage?

One of the first programs I bought was the Psion Vu-File to use for our filing system. I could not get on with it. I have looked at it again with 12 months' experience and can now at least format the layout but The Fast One by Campbell Systems is superior and is supplied with a very comprehensive 12-page instruction manual.

I spent the whole of the first evening playing the various facilities offered. The next evening I formatted the blank program for my requirements. The information was taken from our job file and a computer input data sheet was collated under 13 headings — 1, File No.; 2, Drawing No.; 3, Type No.; 4, Length; 5, Width; and the like.

Our range of equipment was split into 107 types. The Fast One allows you 36 layout formats — I have nine built into our program. Format A contains what I call All File Information and is displayed as one file per screen. Format B is Brief Details and is displayed in column format of file number, type, length, width, drawing number and material of construction. Format C is identical to B but programmed to display in length order. Format D provides an alphabetical customer list with the file number and date, while Format E shows the file number in ascending order with the estimated hours for the job and, if it was built subsequently, the number of hours taken. Formats F, G, H and I provide the headings only for the former formats.

On a visit to the Microfair in London last year I studied a modestly-priced dot



matrix printer, the Seikosha GP100-A, on the Memotech stand. A fellow visitor confirmed that he was a small businessman with such a printer and was delighted with it.

I returned to the office to write a short paper on the use we could make of a computer and its estimated total cost. The project was accepted by my managing director and the printer was bought.

I indicated that the stressing calculations program concluded with "Press L PRINT to obtain a printout". I very soon learned that would not work. The easiest solution to the problem appeared to be the insertion of COPY·COMMAND into the program as each screen full of information had been entered or results obtained.

That was done and the stressing calculation has now been in use for some time. It takes an average of 12 minutes to complete a set of calculations, which may easily have taken half a day previously, plus the bonus of having a print-out to check you have input the correct information and which can be kept in the job file for future reference.

One of our best acquisitions, and subsequently the cause of a major problem, was Q SAVE. It is a relatively inexpensive hardware/software package which speeds loading time by a factor of 16.

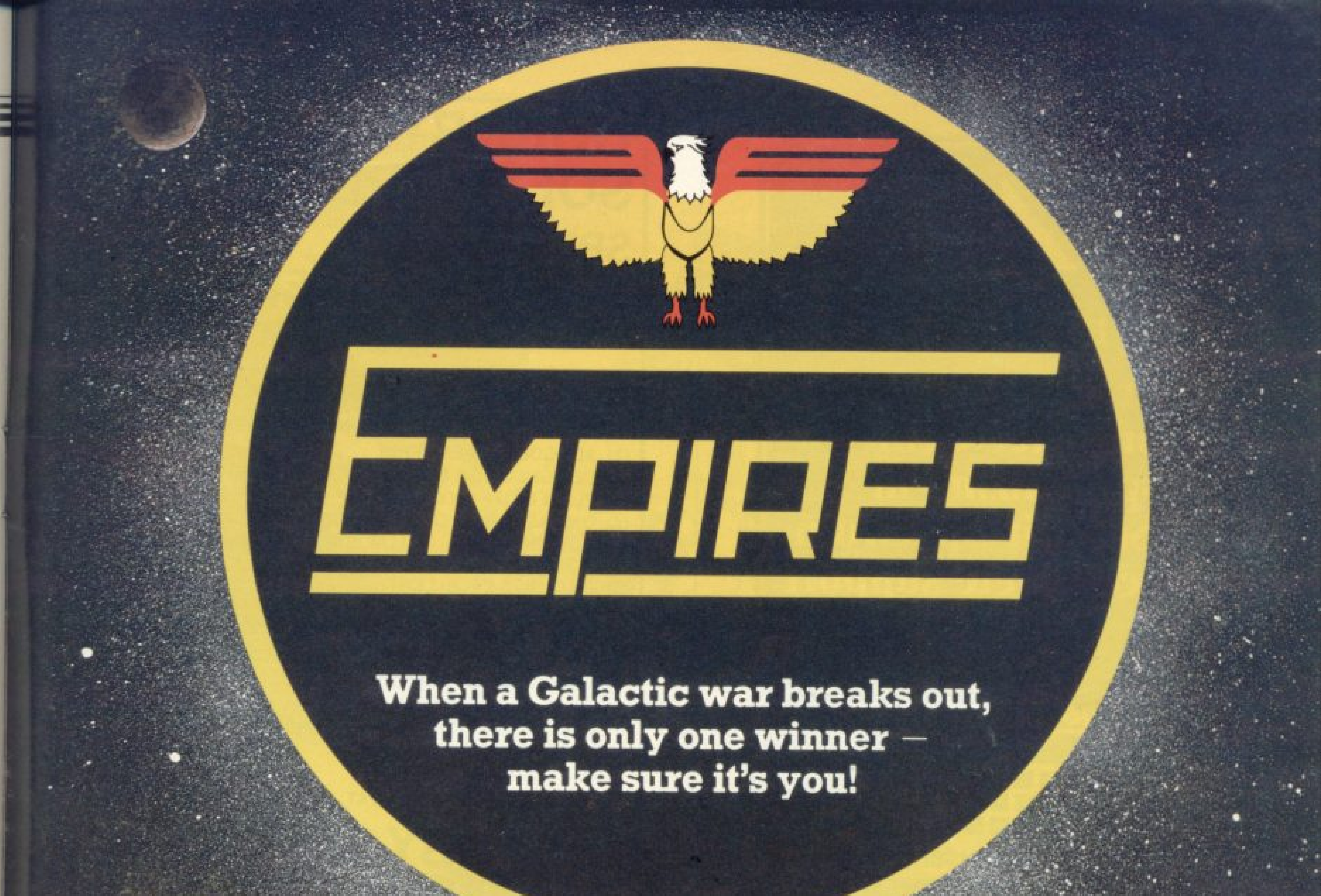
With the complete set-up now running and printing very satisfactorily, a 64K RAM pack was bought. More job file data was collated and stored on tape using the 64K Q SAVE software.

With the printer interface connected, however, Q SAVE would not re-load. Most of you will know that the Sinclair ROM uses locations 0000 to 8191 and RAM memory starts at location 16384. I believe, but do not know for certain, that the Q SAVE software and the printer interface both try to load into the same area of memory between 8K and 16K and cannot.

Alternative 64K RAM packs were tried to no avail and I resolved our problem in the only way I could by accepting 16K and reducing the number of files on each cassette to allow for future expansion.

Thus the system is now installed in my office. Our equipment comprises a ZX-81 housed in a dK'Tronics keyboard chosen because it had a calculator-style numeral pad to the right of the normal keyboard. A ribbon connector from the expansion port to the printer interface/RAM pack prevents wobble and programs are stored on a Boots CR375 tape recorder. The VDU is a Ferguson black-and-white portable. A modest set-up, it is true, but I will have nothing said against the ZX-81. It is a marvellous machine on which to start and its number-crunching power has more than repaid the capital investment.

So what of the future? With the ZX-81 now installed in my office we have a 48K Spectrum at home with Microdrive. Serious programs include Masterfile, MF Print and Tasword. The possibilities of word processing, data storage and printing over a full 80 columns seem endless and very exciting. Back to the late nights? Yes, but that is another story.


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Imagination unlimited

Is Gilsoft weak Quilled? Quentin Heath thinks not

THE QUILL, an adventure game generator from Gilsoft, has evoked a mixed reaction from critics. The technical excellence of the program is not disputed but its spawn, the games compiled using it, have been treated with suspicion by both seasoned adventure players and critics.

The critics have been quick to say that the plethora of games generated by **The Quill,** and released by Gilsoft and others, are almost identical in structure and, in many cases, futile and uninventive. The argument is that anything which has been cloned from another program will be inferior to a program which has been handwritten from beginning to end.

Rather than taking the well-worn path and examining The Quill again, I decided to look at the final products from that program which Gilsoft has called the **Gold Collection.**

The adventures in the Gold series are varied in content and complexity. The six titles are **Spyplane,** a story of espionage; **Magic Castle** and **Barsak the Dwarf,** which lie in the Dungeons and Dragons field; **Mindbender,** for science fiction enthusiasts; **African Gardens,** an adventure for lovers of mystery; and **Diamond Trail,** for the specialist in detection and whodunnits.

Most of the adventures are easy to play but in an irritating way. A case in point is Barsak the Dwarf. You play Barsak, who must search an ancient castle for nine treasures and a visitors' book which you must sign to leave alive. According to the critics the game would be simply a case of wandering round a maze of locations, built around a standard structure, but The Quill is so versatile that it allows a designer to build extra facilities into an adventure.

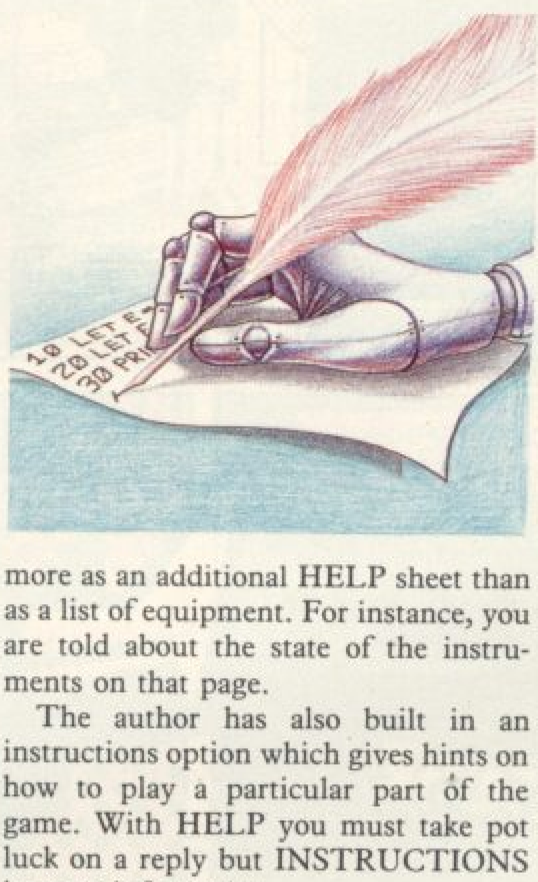
For instance, in Barsak the author has created a situation where the main character will die unless he can find food within 17 moves. Once food has been found, in a jar of pickles, a quest for water must begin.

Barsak contains a quest within a quest. The dwarf must look continually for food while searching for treasure. There is no end, except for the limitations of memory space, to the number of quests which can be built into one package.

One criticism of The Quill which can be sustained is that the program has to put some restrictions on the way in which an adventure runs so that it can operate. The Quill limits input to a compiled program to one line at a time. For most entries needing one verb and a noun, that would be sufficient but if, for instance, you want to pick up more than two objects you must select the first two and press 'ENTER', then the second two, and follow the same process until all the objects have been collected. That seems to be the only instance in which The Quill affects an adventure in an adverse way.

To show the types of adventure The Quill can produce I compared Barsak to another adventure from the Gold series, Spyplane. The plot is certainly different and concerns a search for submarines which you see from your aircraft. By comparing the HELP and INVENTORY functions with those of Barsak you can see the differences between the two programs instantly.

Spyplane is more developed as an adventure. The descriptions are lengthy and the INVENTORY has been used



more as an additional HELP sheet than as a list of equipment. For instance, you are told about the state of the instruments on that page.

The author has also built in an instructions option which gives hints on how to play a particular part of the game. With HELP you must take pot luck on a reply but INSTRUCTIONS is more informative.

Spyplane is more difficult to play than Barsak as you find yourself in an aircraft and are told very little about what you have to do. By using the instruments you will learn more about your task but at the risk of alerting the enemy.

The descriptions of the terrain are evocative but not over-long. There are no spelling mistakes in the text, which is more than can be said for some handwritten textual adventures.

Spyplane is also supplied with a leaflet showing a map of the area in which your aircraft is flying. That is a necessity, as you cannot use graphics, a growing area in adventure games, with The Quill. No doubt some people would find the lack of graphics, where necessary, a fault with the program. It could, however, be argued that setting-up graphics occupies much space within memory which could be used for more text and locations. The lack of graphics facilities in The Quill is, therefore, a benefit to users in the long run.

Looking at The Quill it may be possible to see the way in which an adventure is fitted over a pre-defined grid of locations each time a game is created but the games produced by it hide the mechanical creation process well. It is a case of not being able to see the seams of an adventure, because of the way the author has the imagination to create something different. It is, after all, the programmer and not the program which controls the way a game progresses.

The limitations of The Quill are only those of formatting the screen and the way responses are put into the computer. The Quill is adaptable enough to cope with new ideas of the programmer, such as an instruction function in Spyplane or the continual quests for food and drink in Barsak the Dwarf. Neither are there restrictions on the storyline. Games could be set in fictional or realistic surroundings — the program does not differentiate.

Essentially The Quill offers the programmer a new high-level language rather like Basic. Although Basic has only a set number of statements, the number of applications to which you can apply the language are endless and restricted only imagination.

In the proper hands, The Quill produces programs on a par with handwritten commercial programs and it is that qualification which has to be made clear. The Quill is a tool, just as is Basic. With skilled use it can do wonders.


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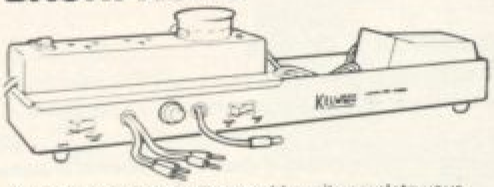


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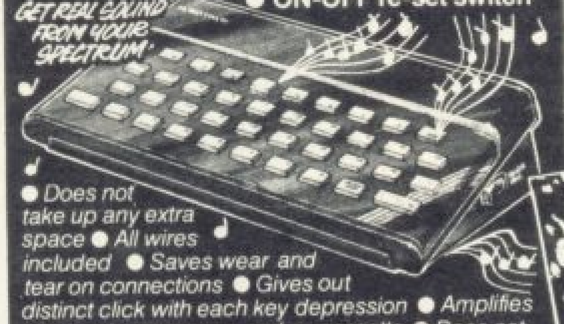
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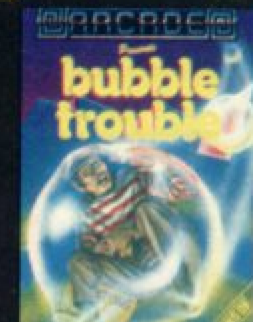
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A splash of Spectrum ink

Andrew Hewson fills in the gaps

TACKLING a problem I have not attempted previously, I aim to describe how to "paint in" an area on the screen.

Consider the rather crude picture of the dog called Spike illustrated in figure one. Spike consists of 45 numbered points and we can imagine that each point is a pixel on the Spectrum screen. Spike's outline is determined by the asterisk characters. Suppose we have a program which will PLOT Spike's shape, i.e., one which will PLOT a pixel at points equivalent to the positions of the asterisks. Our problem is to write a program which will fill in all the internal points by PLOTting a pixel at each of the 45 internal points.

The solution must be general enough to work for any shape, no matter how convoluted, and for any starting-point in the shape. In practice, that means the painting program must keep track of the status of the pixels adjacent to the one which it is painting.

Suppose, for example, the program starts on Spike at position 0 and moves to the right, painting as it goes. It must look and remember that position 5 to the left of position 0 also needs to be painted in when it has completed the current line. The program listed in table one will paint Spike in the order of the numbers on the diagram using the look-and-remember principle.

The program is written so that its subroutines can be MERGEd into the user's program and the region-fill can thus be invoked with a GOSUB. It must be borne in mind that the inherent slowness of Basic is very apparent in this application, so it will normally be necessary to use a machine code routine.

The program remembers unpainted pixels by storing their location and other pertinent information on a pseudo-stack held in the two-dimensional character array S$. A stack is a very useful device for storing information in many circumstances, as it works on a last in, first out principle. The Z-80 makes use of a stack to keep track of the return addresses of its current routines and Sinclair has copied the principle in the Spectrum for holding the line numbers to which RETURNs are made.

```
   *
 * 20 *                           *
 * 19 *  *  *  *  *  *  *  *  21 *
 * 18 17  8  9 10 11 12 13 14 15 16  *
    *  *  7  6  5  0  1  2  3  4 *
       * 22 23 24 25 26 27 28 29 30  *
       * 31 32 33 34 35 36 37  *  *
       * 38 39  *  *  * 42 43  *
       * 40 41  *     * 44 45  *
          *  *           *  *
```

Figure 1. Spike the dog. This picture is used to demonstrate the painting technique.

Thus whenever the program completes the task of painting a line of pixels it looks to the stack for a new location at which to start painting again. The act of storing information is called, in Z-80 jargon, PUSHing, and retrieving information is called POPping.

The program also uses a recursive technique of which readers may not have heard previously. A recursive routine is one which is able to call itself and returns to itself when it has finished. At first sight that may seem to be impossible but with careful programming and the use of a stack it is a compact and efficient technique.



• *Please address problems and queries to Andrew Hewson, Helpline, Graham Close, Blewbury, Oxfordshire.*

The easiest way to understand recursion is to follow the logic of a program which uses it, as explained, but the reader who has never encountered it might like to bear in mind the old joke about the entry in a dictionary of computing under the word recursion which read: Recursion — see recursion.

The program in table one consists of a test routine of a circle in a square and a call to the subroutine at line 1000 which executes the task. In the following explanation, however, the reader should refer to Spike the dog in figure one. The fill routine is invoked by a GOSUB 1000, with x and y containing the x and y ordinates of any point inside the region to be filled.

At line 1000, a check is made to ensure that (x, y) is within the Spectrum screen and at 1010 a check is made to see if the point is PAPER or INK. If (x, y) is OUT OF SCREEN or is INK — i.e., on the border of the region — an immediate RETURN is made. Otherwise the local variables — that is to say the ones used in this module only and not needed elsewhere are cleared to zero.

Line 1200 is where the work starts. The two formal parameters, x and y, are saved on stack along with the local variables left, right and here. Note that since screen co-ordinates lie in the range 0 to 255, the values can be saved as a single byte in a byte array as opposed to five bytes as in a floating point array, thus saving 20 bytes per level of the stack.

At lines 1245-1250, a second check is made for (x, y) being out of screen or ink. Those checks are required a second time because the subroutine re-enters itself recursively at line 1200, thus missing the checks at line 1000. If the conditions are met, GOTO 1340 causes the removal of the most recently saved set of local variables from the stack prior to RETURNing, so that the number of PUSHes and POPs balance.

Next, the positions of the right-most and left-most PAPER pixels which occur before any kind of obstruction are found. Those SCANs are made INK, and right and left are given the values of their respective x-ordinates. In the case of Spike the dog, starting at point 0 — 1, 2, 3 and 4 are filled; right becomes 4; then 5, 6, 7 are filled and left becomes 7. All those operations are carried out by calling the subroutine at 1500.

The region-fill routine contains several subroutines. The Basic subroutine called SCAN is listed in lines 1500-1550. It starts at the point (x, y), and scans rightwards along a row of pixels, making each one INK until an INK pixel is reached. The x-ordinate of the

continued on page 135

continued from page 133

of the right-most PAPER pixel is put into right. It then scans leftwards from (x, y), INKing as before, putting the left-most PAPER pixel's x-ordinate into left.

The plotting is performed by the subroutine at line 2000 which is called twice, once for moves to the right and once for moves to the left. It knows in which direction to scan from the value of dir because dir is added to the x-ordinate of the next pixel to be INKed, and so a value of +1 will cause a move right and −1 will cause a move left.

SCAN is called from line 1270. On return, here takes on the value of left, the left-most pixel in the current (y) line. Line 1300 causes the search for left and right ends to re-start from the line above.

Lines 1290-1325 are the most difficult part of the routine to understand. What they say, for Spike, is 'Move up to point 8 (y=CODE s$(sp,z)+1). Then call myself, recursively, from line 1300 to scan points 9-16 then 17 and 18 in the same way as I did 1-4 and 5-7. At line 1300 again, point 18, move up one line and scan right then left. As there is only one point, left and right both become 19. Do the same again, producing point 20. Then, on the next GOSUB 1200 from line 1300, line 1250 will sense that point 20 is already INK, so an immediate POP/RETURN takes place. I execute line 1310 to scan one line downwards and again, at 1250, an INK pixel is found — so I POP/RETURN. I am now at line 1320, with here being point 18. I increment here and loop back to line 1300 where the procedure recurses for point 17.

As the pixels above and below point 17 are both INK, I loop back to line 1300 and try again for point 8. That goes on until I reach point 15, where I find that the pixel above is still PAPER. I fill this, scan right and left recursively, but I have INK on all four sides. Here is thus incremented to point to point 16 and I try up and down again. That fails, so here is incremented to point to the right of point 16, so here ceases to be less than or equal to right and I go on to POP/RETURN at line 1340.

Having returned from my original GOSUB 1200 at line 1300, I can execute line 1310. That causes me to scan down one line and begin the right-left movement from point 22. I scan right, left, up, down repeatedly until all PAPER pixels become INK. Eventually I am back at point 4 and line 1320. I increment here, the test at line 1325 fails, and I POP. Then the RETURN picks up the return address from the main body of the program where I GOSUB 1000 '0, and I have finished.

It can be seen that once scanning is started on the line below point 7, all the upward scans are redundant, since the higher points are all INK. There is a similar redundancy when points 8, 9, 10 . . are being scanned to 'find' point 21. Those redundant statements must still be performed for recursion to work properly, as they will cease eventually to be redundant — e.g., at point 15. The routine appears to stop for a time on its way downwards while the redundant calls are being performed and then the return addresses are being pulled off the stack. That is a feature of recursion.

To show the extent of stack usage, the demonstration program fills the area of a square with an inner circle, avoiding the inside of the circle. Lines 1205 and 2025 are test lines to display the stack pointer and x and y parameters on each successive call. They show how stack space is gobbled-up.

Table 1. A Spectrum program to demonstrate the principles of region filling.

```
10 REM Variables names used by the fill routine:
12 REM x,y = Co-ordinates to start filling from
14 REM left, right = positions of left & right
16 REM here = x-ordinate from which tests begin
18 REM s$(xx,5) = 5 stacks, used to save local variables
20 REM sp = Stack Pointer (see below)
22 REM Local variables are as follows on the stack —
24 REM    s$(sp,1) = x, s$(sp,2) = y
26 REM    s$(sp,3) = left, s$(sp,4) = right
28 REM    s$(sp,5) = here
30 REM next = x-ordinate of next pixel to be tested
32 REM dir = +1 to text right of 'here', -1 to test left
50 REM Draw a circle within a square as a test shape.
55 REM Then set x & y to point to a position inside the
60 REM square but not inside the circle, and call the
65 REM region fill routine at line 1000.
70 REM An immediate RETURN is made if (x,y) is off the screen
75 REM or is an INK point (i.e. on the region's border).
100 PLOT 150,60
110 DRAW 50,0: DRAW 0,50: DRAW -50,0: DRAW 0,-50
120 CIRCLE 175,85,20
140 LET x=175: LET y=62
150 GO SUB 1000
170 STOP
1000 IF x<0 OR x>255 OR y<0 OR y>175 THEN RETURN
1010 IF POINT (x,y) THEN RETURN
1024 REM Clear variables
1025 LET sp=0
1030 LET left=0: LET right=0: LET here=0
1099 REM Beginning of recursive routine — 'push' variables
1200 LET sp=sp+1
1205 PRINT AT 0,0;sp;" "
1208 REM Note the assignment to s$(sp,2)
1209 REM which stops y becoming negative and confusing CHR$..
1210 LET s$(sp,1)=CHR$ x: LET s$(sp,2)=CHR$ ((y>0)*y)
1220 LET s$(sp,3)=CHR$ left: LET s$(sp,4)=CHR$ right
1230 LET s$(sp,5)=CHR$ here
1244 REM If (x,y) is OUT OF SCREEN or is INK, exit the routine
1245 IF x<0 OR x>255 OR y<0 OR y>175 THEN GO TO 1340
1250 IF POINT (x,y) THEN GO TO 1340
1268 REM Find out the positions of the extreme left & right
1269 REM of the current line of pixels
1270 GO SUB 1500
1286 REM Beginning at the left-hand end of the current line,
1287 REM check the lines above and below for obstructions
1288 REM Note that 'y' has to be loaded from its saved value
1289 REM on the stack, since the recursion alters it
1290 LET here=left
1300 LET x=here: LET y=CODE s$(sp,2)+1: GO SUB 1200
1310 LET x=here: LET y=CODE s$(sp,2)-1: GO SUB 1200
1320 LET here=here+1
1323 REM Do the above repeatedly until the right-hand end of
1324 REM the line is reached
1325 IF here<=right THEN GO TO 1300
1339 REM Pop the previous values of the variables, then exit
1340 LET x=CODE s$(sp,1): LET y=CODE s$(sp,2)
1350 LET left=CODE s$(sp,3): LET right=CODE s$(sp,4)
1360 LET here=CODE s$(sp,5)
1370 LET sp=sp-1
1380 RETURN
1498 REM Get ready to check the line for obstructions
1499 REM by clearing 'next'
1500 LET next=0
1518 REM Check right then left, load 'right' and 'left'
1519 REM with the positions of the last PAPER pixels found
1520 LET dir=+1: GO SUB 2000: LET right=next-1
1530 LET dir=-1: GO SUB 2000: LET left=next+1
1550 RETURN
1598 REM This routine returns with 'next' as the x-ordinate
1599 REM of the border to fill upto on the current line
2000 LET next=x
2010 PLOT next,y
2020 LOT next,y
2025 PRINT AT 1,0;next,y;" "
2030 LET next=next+dir
2035 IF next <0 OR next>255 THEN RETURN
2040 IF NOT POINT (next,y) THEN GO TO 2020
2060 RETURN
```

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DELETE a block of lines
DO-LOOP structure
DPOKE double poke
EDIT specified line
ELSE (used with IF ... THEN)
EXIT leave DO-LOOP
FILL enclosed area with specified ink or paper
GET wait for keypress
JOIN two program lines
KEYIN a string
KEYWORDS new keywords on/off
LIST/LLIST line TO line
USED (used with GOTO, GOSUB)
ON ERROR trap errors (with LINE, STAT and ERROR)
PLOT a string (may contain cursor control codes)
POKE a string
POP Basic's stack
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RENUM versatile renumber
ROLL all or part of screen in any direction by specified number of pixels, with or without attributes
SCROLL like ROLL, but without wrap-round
SORT arrays (very fast)
SPLIT program lines
TRACE program execution
UNTIL used with DO or LOOP
USING used with PRINT
WHILE used with DO or LOOP
XOS, YOS move PLOT origin
XRG, YRG change PLOT scale

FUNCTIONS

AND (bit-by-bit)
BIN$ decimal to binary
CHAR$ number to 2 characters
COSE fast cosine
DEC hexadecimal to decimal
DPEEK double PEEK
FILLED filled area
HEX$ decimal to hexadecimal
INSTRING string search
MEM free memory
MEMORY$ all of memory as a string
MOD modules
NUMBER 2 characters to number
OR (bit-by-bit)
RNDM fast RND
SCRN$ recognises user graphics
SINE fast sine
STRING$ repeats strings
TIME$ current time
USING$ formats numbers
XOR (bit-by-bit)

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ZX-81

Adventure

Adventure 1	Abersoft	6
Barrow Quest	Sherry	*
Black Crystal	Carnell	7
Dr. Whom	D. Biggs	*
Dungeons of Doom	Woosoft	*
Espionage Island	Artic	*
Greedy Gulch	Phipps	7
Inca Curse	Sinclair	*
Knight's Quest	Phipps	*
Lost Island	JRS	*
Magic Mountain	Phipps	*
Merchant of Venus	Crystal	7
Pharoah's Tomb	Phipps	*
Pimania	Automata	6
Secret Valley	Newsoft	*
Serpents Tomb	Vortex	*
Ship of Doom	Artic	7
The Great Western	New Soft	*
Time Bandits	New Soft	*
Tomb of Dracula	Felix	*
Trader Trilogy	Quicksilva	6
Volcanic Dungeon	Carnell	5
World of Illusions	Contrast	4

Arcade

Alien Dropout	Silversoft	*
Asteroids	Silversoft	8
Asteroids	Software Farm	6
Astral Convoy	Vortex	*
Bank Robber	Romik	6
Bubble Bugs	Romik	6
Byter	Protek	*
Cassette 1	Orwin	7
Cassette 2-5	Orwin	7
Damper	Quicksilva	7
Defenda	Quicksilva	8
Door Slammer	Cathedral	7
Forty-Niner	Software Farm	9
Froggy	DJL	7
Full-screen Breakout	New Generation	*
Galactic Trooper	Romik	6
Galaxian	Quicksilva	6
Galaxy Jailbreak	Romik	6
Games	P Teakle	*
Games 2	JRS	*
Games Tape 1	J K Greye	*
Games Tape 2	J K Greye	*
Games Tape 3	J K Greye	*
Glooper	Quicksilva	7
Gloops	Quiclsilva	5
Gobbleman	Artic	*
Gobbler	Software Farm	*
Grand Prix	dK' Tronics	*
Gulp 2	Campbell	*
Hang Glider	S Electronics	6
Hickstead	CCS	5
High-resolution Invaders	Odyssey	*
Invaders	Abersoft	*
Invaders	Bug-Byte	*
Invaders	Odyssey	8
Invaders	Selec	7
Invaders	Silversoft	*
Krazy Kong	PSS	*
Maze Death Race	PSS	*
Maze Man	Abersoft	*
Mazogs	Bug-Byte	*
Namtir Raiders	Artic	8
Night Gunner	Digital Int.	5
Puckman	Hewson	*
Six Games	A Stubbs	5
Space Raiders	Sinclair	*
Space Trek	JRS	*
Swag + Voyager	Howard	*
3D Monster Maze	New Generation	9
Three Games Cassette	McGraw Hill	8
Zuckman	DJL	8
ZX Invasion Force	Artic	*
ZX Panic	Selec	4
ZX-81 1K Games Pack	Crystal	9
ZX-81 Pocket Book	Phipps	*

Business

Accounts (Limited company)	Hestacrest	*
Accounts (Sole Trader)	Hestacrest	*
Business Bank Account	Transform	*
Critical Path Analysis	Hilderbay	6
Draft	Myrmidon	*
Mailing List	Hestacrest	*
Payroll	Hilderbay	*
Payroll	Soft Tech	*
Payroll	Soft Tech	*
Personal Banking System	Hilton	*
Purchase Ledger	Hestacrest	*
Sales Day Book	Transform	*
Sales Ledger	Hestacrest	*
Text	Contrast	8

Education

Calpac 1-2	Calpac	*
Four Rules of Number	Micro Master	*
Integration	University	8
Intermediate English 1-2	Rose	*
Intermediate Maths 1-2	Rose	*
Language Devel. Series	Glasson	*
Language Devel. Series	Micro Master	*
Linear Programming	University	*
Matrix Operations	University	7
O Level Chemistry	Calpac	*
O Level French Revision	Rose	*
O Level Maths Revision	Rose	*
Polynomials	University	*
Primary Arithmetic	Rose	*
Regression	University	*
Self-teach Program	Anvil	*

Language

Forth	Sinclair	7
ZX Forth	Artic	8

Practical

Ephemeris	Bridge	7
Football Pools	Hartland	*

Puzzle

Nowotnik Puzzle	Phipps	*
Word Fit	Ram Writer	6

Simulation

Fighter Pilot	Digital Int.	5
Flight Simulation	Sinclair	6
Pilot	Hewson	7
Print Shop	CCS	*

Strategy

Airline	CCS	7
Auto Chef	CCS	7
Bank Raid	J M Senior	*
Battleships	JRS	*
Conflict	Martech	7
Cyborg Wars	Stratagem	7
Dallas	CCS	6
Farmer	CCS	*
Football Manager	Addictive Games	7
Fort Apache	Contrast	8
Galaxy Conflict	Martech	8
Great Britain Ltd	Hessel	*
Ocean Trader	Quicksilva	7
Pioneer Trail	Quicksilva	7
The Settler	BSS	*

Traditional

Do Not Pass Go	Work Force	*
Lynchmob	Bridge	6
Original Superchess	CP Software	*
Othello	M.O.I.	*
Tai	PSS	*
Tenpin	Phipps	*
ZX 1K Chess	Artic	*
ZX Compendium	Carnell	7
ZX-Chess I	Artic	*

Utility

Graphics	IPA	*
Graphics Toolkit	JRS	9
HI Resolution	CRL	6
Machine Code Test Tool	OCP	*
MCoder	PSS	8
Programme Enhancement Package	R and R	*
Renumber Delete	Work Force	*
Sideways Copy	D King	*
Trace	Texgate	7
ZX Compiler	Silversoft	*
ZX Screenkit	Picturesque	*
ZX-81 Remload	Picturesque	*
ZX-Bug	Artic	*
ZX-sideprint	Microsphere	*
ZXAS	Bug-Byte	*
ZXDB	Bug-Byte	*

SPECTRUM 16K

Adventure

Android One	Vortex	*
Escape	New Generation	8
Mines of Saturn/Return to Earth	Mikro-Gen	*
Moria	Severn	*
Planet of Death	Artic	6
Secret Valley	Newsoft	*
The Great Western	New Soft	*
Time Bandits	New Soft	*

Arcade

Aquarius	Bug-Byte	6
Arcadia	Imagine	5
Arcadian	J K Greye	6
Assassin	Spectrasoft	*
Attack on New York	Fry	*
Avenger	Abacus	5
Baltic Patrol	E. Midland	*
Baron	Temptation	*
Base Invaders	Imagination	*
Black Hole	Quest	6
Blind Alley	Sunshine	7
Breakaway	Procom	*
Bug Blaster	Crystal	*
Cassette A	Orwin	*
Caterpillar	CDS	*
Cavern Fighter	Bug-Byte	4
Centi-bug	dK' Tronics	*
Children's Compendium	Dymond	*
City Defence	Mikro-Gen	*
Colour Clash	Romik	4
Cookie	Ultimate	*
Cosmic Guerilla	Crystal	8
Creepy Crawler	Mikro-Gen	*
Crevasse and Hotfoot	Microsphere	7
Cruising	Sunshine	4
Cyber Rats	Silversoft	7
Death Chase	Micromega	6
Demolition	Comp. Rentals	*
Destroyer	Winters	*
Di-lithium Lift	Hewson	3
Digger Dan	Ocean	*
Doombugs	Work Force	8
Dymonoids	Dymond	*
Earth Defence	Artic	5
Ed-On	Add-On	4
Eskimo Eddie	Ocean	*
Family Games Pack	Hornby	*
Fireflash	Abacus	5
Froggy	DJL	7

Fruit Line	P A Hanson	*
Fruit Machine	dK' Tronics	6
Galactians	dK' Tronics	*
Galactic Trooper	Romik	3
Galactic Warriors	Abacus	6
Galaxians	Artic	6
Games Pack 1	A Burnham	*
Games Tape 1-2	Sospan	*
Ghost Hunt	PSS	*
Gnasher	R & R	8
Gobble-a-Ghost	CDS	*
Gobbleman	Artic	*
Godzilla and Martians	Temptation	7
Gorilla	D Hornsby	*
Ground Attack	Silversoft	6
Ground Force Zero	Titan	*
Gulpman	Campbell	*
Haunted Hedges	Micromega	6
Hopper	PSS	6
Horace and the Spiders	Sinclair	8
Horace Goes Skiing	Sinclair	8
Hungry Horace	Sinclair	8
Invasion Force	Artic	8
It's the Wooluf	Crystal	5
Jet Pac	Ultimate	*
Jogger	Severn	*
Labyrinth	Axis	4
Leap Frog	CDS	*
Light Cycle	PSS	*
Luna Crabs	Micromega	7
Magic Meanies	CDS	2
Maze Chase	Hewson	8
Meteor Madness	Spectresoft	*
Meteor Storm	Quicksilva	7
Meteoroids	dK' Tronics	7
Meteoroids	Softek	6
Millypede	Add-on	7
Mined Out	Quicksilva	7
Moon Buggy	Visions	6
Muncher	Silversoft	*
Muncher	Silversoft	6
Nanas	Mikro-Gen	*
Orbiter	Silversoft	7
Ostron	Softek	*
Pengy	Micromania	4
Pitman Seven	Visions	*
Planetoids	Sinclair	8
Proteus	Abacus	5
Rapedes	Visions	*
Repulsar	Softek	*
Rider	Virgin	6
Road Toad	DK Tronics	7
Robot Panic	Soft Mill	1
Sam Spade	Silversoft	5
Santa	Artic	*
Sentinel	Abacus	7
Shark Attack	Romik	5
Sheer Panic	Visions	7
Shiva Special 1	Shiva	*
Sky Raider	C M Smith	*
Slippery Sid	Silversoft	8
Space Fighter	Winters	*
Space Intruders	Quicksilva	7
Space Lanes	Cathedral	*
Space Raiders	Sinclair	6
Space Zombies	Mikro-Gen	*
Spec. Frogs/ Showdown	Artic	*
Spec. Gobbleman	Artic	*
Spec. Invaders	Artic	*
Spec. Invasion Force	Artic	*
Spec. Scramble	Work Force	7
Spectipede	R and R	8
Spectral Invaders	Bug-Byte	8
Spectral Panic	Hewson	5
Spectres	Bug-Byte	6
Strike Four	Spectresoft	4
Styx	Bug-Byte	7
Sub	Romik	*
Tank Battle	dK' Tronics	8
The Devil Rides In	Carnell	*
3D Monster Chase	Romik	3
Train Game	Microsphere	9
Trom	dk'Tronics	4
Vortex	JK Greye	5
Winged Warlord	CDS	6
Wizard's Warriors	Abersoft	*
Yomp	Virgin	7

Business

Finance Manager	OCP	9
Home Computer Pack	SD Micro	*
Masterfile 16	Campbell	*
Matcalc	Work Force	*
Micropen	Contrast	*
Vu-Calc	Sinclair	7
Vu-File	Sinclair	8

Education

Alphabet	Widget	*
Alphabet Games	Sinclair	*
Apostrophe	Sinclair	7
Ballooning	Heinemann	*
Calpac 1-3	Calpac	*
Car Journey	Heinemann	*
Cargo	Sinclair	*
Chess Tutor	Artic	7
Counting	Starter Soft	*
Counting	Widget	*
Education One	Lerm	*
Educational	Startersoft	*
Firework Music	Soft Cottage	8
First Numbers	Collins	*
40 Education Games	Granada	*
Four Rules of Number	Micro Master	*
French Voc Test	Tutorial	*
Hidden Letters	Poppy	*
Hot Dot Spotter	Longman	*
Integration	University	8
Intermediate English 1-2	Rose	*
Intermediate Maths 1-2	Rose	*
Know Your Tables	Collins	*
Language Devel. Series	Glasson	*
Language Devel. Series	Micro Master	*
Learn Basic	Logic 3	*
Learning Read 1	Poppy	*
Linear Programming	University	*
Marks Book	Lerm	*
Maths Invaders	Stell	*
Maths Tutor	AD Software	*
Matrix Operations	University	7
Money	Poppy	*
Night Sky	Bridge	*
Number 6	Prime	*
O Level Maths	Homestudy	*
O Level Physics	Homestudy	*
Paddington's Shopping Mix-up	Collins	*
Pathfinder	Widget	*
Polynomials	University	8
Pre/early school cassettes	Essex	*
Primary Arithmetic	Rose	*
Punctuation Pete	Heinemann	*
Regression	University	8
Self-teach Program	Anvil	*
Shape Sorter	Widget	*
Special Agent	Heinemann	*
Spellbin	Startersoft	*
Teacheraid	B Farris	*
Use and Learn	Microl	8

Language

Beta Basic	Betasoft	9

Practical

Biorythms	Spectrasoft	*
Countries of the World	Hewson	8
Cycle Planner	Medidata	4
Map of the UK	Kuma	7
Shopping List	SD	*
Spectasort	Spectadraw	4

Puzzle

Flippit	Sinclair	7
Hanoi King	Contrast	7
Lojix	Virgin	3
Nowotnik Puzzle	Phipps	7
Quazar	Rose	4

Simulation

Air Traffic Controller	Hewson	6
Airliner	Protek	6
Golf	R & R	7
Golf	Virgin	8
NightFlite	Hewson	5
Print Shop	CCS	8
Pro-Golf	Hornby	7

Strategy

Auto Chef	CCS	*
Big Match Soccer	Winters	*
Dallas	CCS	6
Dictator	Bug-Byte	*
Farmer	CCS	*
Football	Winters	*
Heathrow	Hewson	8
Las Vegas	Temptation	*
Quincy	Severn	*
The Settler	BSS	*

Traditional

Backgammon	Hewson	*
Bridge Tutor	CP	8
Bridgemaster	Bridgemaster	9
Challenge	Temptation	*
Gambling Tape	Dymond	*
Las Vegas	Temptation	5
Odds-on	RSD	*
Othello	CP Software	*
Othello	M.O.I.	*
Pinball	Winters	*
Pool	Bug-Byte	7
Reversi	Sinclair	8
Roulette	Newsoft	*
Solo Whist	Video Soft.	*
Spec. Microchess	Artic	*
Super Play I	Video	*
Tennis	Winters	*

Utility

Aspect	Bug-Byte	5
Audio Sonics	Work Force	4
Auto Sonics	Buttercraft	5
Basic Utilities	Jaysoft	6
Character Generator	Spectrasoft	*
Designer	Matrix	*
Dietron	Custom	6
Disassembler	dK' Tronics	7
Display	Work Force	*
Editor/Assembler	Picturesque	8
Extended Basic	CP	7
FP Compiler	Softek	9
Keysounder	S and G	*
Letterfont	Allanson	8
Machine Code Test Tool	OCP	7
Master Toolkit	OCP	7
MCoder	PSS	8
Micro-print	Myrmidon	*
Micropen	Contrast	*
Peek	Zen	*
Print Utilities	Sinclair	7
Programmer's Dream	Work Force	8
Renumber Delete	Work Force	*
Slow Loader	ELR	9
Sound FX	dK' Tronics	6
Spec. Bug	Artic	*
Spec. Editor/ Assembler	Picturesque	8
Spec. Monitor	Picturesque	8
Spec. Sound	M Afzal	*
Spec. Tape Copier	S Giza	*
Spectrum Super Toolkit	Nectarine	8
Spectsound	PDQ	2
Supercode	CP	8
Tape Breaker	Spectrasoft	*
Tape Copier	Lerm	*
Taswide-64	Tasman	*
The Key	Keysoft	*
Trace	Texgate	8
Trace	Zen	*
TT-S	Timedata	8
X Ray	Zen	*
ZXED	dK' Tronics	*

SPECTRUM 48K

Adventure

Abyss	CCS	6
Ace in the Hole	Add-on	*
Adventure 1	Abersoft	6
Adventure Island	Contrast	*
Alchemist	Imagine	*
Arcane Quest	Add-on	*
Atlas Assignment	Virgin	7
Black Crystal	Carnell	7
Black Dwarf's Lair	Newsoft	*
Black Planet	Phipps	7
Byte	CCS	3
Castle Blackstar	SCR	7
Circus	Dig Fant	8
Classic Adventure	Melbourne Hse	*
Colditz	Phipps	8

Colossal Caves	CP	8
Cry Wolf!	Add-on	*
Crypt	Carnell	6
Demon Lord	MCE	5
Detective	Arcade	7
Devils of Deep	Shephard	*
Diamond Quest	CCS	4
Diamond Trail	Gilsoft	7
Dragonsbane	Quicksilva	6
Dungeon Master	Crystal Comp.	8
Dungeons of Doom	Temptation	3
Espionage Island	Artic	5
Everest Ascent	Shepard	6
Fantasia Diamond	Hewson	7
Golden Apple	Artic	7
Gorgon	Phipps	*
Halls of Things	Crystal Comp.	9
Here comes the sun	Alligata	7
Hobbit	Sin/Melborne Hse.	9
Hole	Add-on	*
Horror Atoll	Add-on	*
Inca Curse	Sinclair	6
Invincible Island	Shephard	8
Island	Crystal	4
Island	Virgin	7
Jericho Road	Shards	7
Jungle Adventure	CCS	4
Knight's Quest	Phipps	6
Leopard Lord	Add-on	4
Lords of Time	Level Nine	8
Lost Over Bermuda	Add-on	*
Mad Martha	Miko-Gen	7
Mad Martha II	Mikro-Gen	*
Mountains of Ket	Incentive	8
Murder at Manor	Gemtime	7
Oracle's Cave	Doric	8
Perseus and Adromeda	Dig Fant	7
Pimania	Automata	7
Quest	Hewson	7
Quetzalcoatl	Virgin	8
Roundsby Incident	Add-on	*
Satan's Pendulum	Minatron	7
Ship of Doom	Artic	7
Solaris	Softel	*
Superspy	Shepherd	5
Terror from The Deep	Add-on	*
The Castle	Bug-Byte	*
The Orb	Comp. Rentals	*
Time Quest	Mikro-Gen	*
Tomb of Dracula	Felix	*
Transylvanian Tower	Shepherd	*
Urban Upstart	Shepherd	*
Valhalla	Movisoft	7
Vampire Village	Terminal	4
Velnor's Lair	Quicksilva	8
Volcanic Dungeon	Carnell	6
Who Dares Wins	E. Midland	*
Wilfred the Hairy	Microbyte	2
Ziggarat of Dread	Add-on	*

Arcade

Ad Astra	Gargoyle Games	8
Adven. St. Bernard	Carnell	7
Android Two	Vortex	*
Ant Attack	Quicksilva	8
Arena 3000	Microdeal	5
Armageddon	Silversoft	3
Atic Atac	Ultimate	8
Base Invaders	Work Force	6
Bear Bovver	Artic	6
Birds and Bees	Bug-Byte	8
Blade Alley	PSS	6
Blue Thunder	R Wilcox	6
Brain Damage	Silversoft	*
Bubble Buster	Sinclair	5
Bubble Trouble	Arcade	*
Bugaboo	Quicksilva	7
Caesar the Cat	Mirrorsoft	7
Carnival	Eclipse	5
Centipoid Plus 3	Orwin	5
Chequered Flag	Sinclair	8
Chuckie Egg	A & F	8
Chuckman	CCI/Add-on	8
Close-In	Pulsonic	4
Codename Mat	Micromega	9
Corridors of Genon	New Gen.	9
Cruise Attack	Mikro-Gen	*
Cyber Zone	Crystal	*
Defenda	Interstella	2
Deffendar	Mikro-Gen	*
Defusion	Incentive	6
Demon	Microcosm	*
Demon Chase	Mansfield	4
Devil Rides In	Carnell	7
Dimension Destructors	Artic	8
Dinky Digger	Postern	4
Dodge City	Phoenix	7
Dr Franky and the Monster	Virgin	6
Driller Tanks	Sinclair	3
Elektro Storm	PSS	*
Energy 30,000	Elm	3
Eric and the Floaters	Sinclair	6
Eskimo Eddie	Ocean	4
Fred	Quicksilva	6
Freez Beez	Silversoft	*
Galaxy Attack	Sunshine	4
Glug Glug	CRL	6
Harry Goes Home	Pulsonic	6
Hickstead	CCS	4
High Noon	Work Force	9
House of Living Dead	Phipps	*
Hunchback	Ocean	7
Invasion Body Snatch.	Crystal	9
Jackpot	Comp. Rentals	*
Jet Pac	Ultimate	8
Jet Set Willy	Software Projects	9
Killer Knight	Phipps	5
Knight Rider	Hewson	*
Krakatoa	Abbex	8
Krazy Kong	PSS	*
Laser Zone	Quicksilva	8
Last Sunset Lattica	Arcade	*
Lazatron	Contrast	*
Loony Zoo	Phipps	6
Lunar Jetman	Ultimate	8
Manic Miner	Bug-Byte	9
Maze Death Race	PSS	*
Maziacs	dK' Tronics	8
Metagalactic Llamas	Salamander	8
Mission Impossible	Silversoft	6
Mission Omega	Pulsonic	4
Monkey Biznes	Artic	7
Moon Alert	Ocean	*
Mr Wimpey	Ocean	7
Mummy Mummy	Lothlorien	6
Munnery's Mergatroids	Abacus	6
1994	Visions	4
Olympimania	Automata	6
Orion	Software Projects	5
Paratroopers	Rabbit	4
Pat the Postman	Mikro-Gen	*
Pedro	Imagine	7
Penetrator	Melbourne Hse	7
Pi-Balled	Automata	7
Pi-Eyed	Automata	6
Psi-Spy	Postern	5
Pssst	Ultimate	7
Pyramid	Fantasy	8
Raider Cursed Mine	Arcade	*
Reactor	Gemini	7
Rescue	Comp. Rentals	*
Rescue	Ocean	*
Rider	Virgin	6
Robot Riot	Silversoft	6
Rommels Revenge	Crystal	8
Scuba Dive	Durrell	9
Security Shelter	Add-on	*
Skull	Games Machine	5
Sorcery	Virgin	7
Space Station Zebra	Beyond	6
Spectron	Virgin	6
Splat	Incentive	8
Tank Trax	Mastertronic	3
The Guardian	PSS	6
The Pyramid	Fantasy	7
The Snowman	Quicksilva	8
3D Lunattack	Hewson	6
3D Seiddab Attack	Hewson	5
3D Star Wars	Add-on	1
3D Tunnel	New Generation	9
Time Gate	Quicksilva	8
Timebomb	CDS	7
Tobor	Add-on	7
Tranz Am	Ultimate	*
Trashman	New Generation	8
Traxx	Quicksilva	7
Tribble Trubble	Software Projects	8
Trom	dK'Tronics	4
Tube Train Terror	JRS	*
Tutankhamun	Micromania	8
Warlock of Firetop Mountain	Penguin	*
Wheelie	Microsphere	7
Worm Attack	Pulsonic	2
Xadom	Quicksilva	4
Zig-Zag	dK'Tronics	7
Zipper Flipper	Sinclair	4

Business

Account Management System	Fulwood	*
Accounts (Limited Company)	Hestacrest	*
Accounts (Sole Trader)	Hestacrest	*
Address File	SD Micro	*
Address Manager	OCP	7
Bank Account System	K Gouldstone	8
Bank Verifier	SD Micro	*
Business Bank Account	Transform	*
Cash Controller	Shepherd	7
Collector's Pack	Sinclair	7
Critical Path Analysis	Hilderbay	*
Database	Microl	7
DIY Book-keeping	RAMTOP	*
Masterfile	Campbell	8
Omnicalc	Microsphere	9
Payroll	Hilderbay	9
Personal Banking System	Hilton	*
Personal Financ. Management Syst.	Fulwood	*
Sales Day Book	Transform	*
Small Business Accounts	Sinclair	*
Spreadsheet	Microl	7
Tasword	Tasman	8
Tasword II	Tasman	9
Utility File	SD Micro	*
Word Processor	Microl	*

Education

ABC Liftoff	Longman	*
Angle	Chalksoft	5
Angle Turner	Arnold Wheaton	7
Astro Maths	Scisoft	6
Castle Spellerous	Sinclair	8
Chess Tutor 1	Sinclair	7
Countabout	Longman	*
French is Fun	CDS	5
French Mistress	Kosmos	*
French Voc Test	Tutorial	*
German is Fun	CDS	8
German Master	Kosmos	*
Guitar Tutor 1	Harlequin	*
Guitar Tutor 2	Harlequin	*
Handwriting	Chalksoft	*
Humpty Dumpty	Widget	8
Inkosi	Chalksoft	5
Jungle Jumble	Clever Cloggs	*
Jungle Maths	Scisoft	*
Learn to Read 1-5	Sinclair	7
Letters and Numbers	Jimjams	*
Magnets	Sinclair	*
Make-a-Chip	Sinclair	*
Mansfield Park	Sussex	7
Mathskills II	Griffin	7
Model Maths	Jive	*
Mr. Men	Mirror	*
Musicmaster	Sinclair	6
Nineteenth C. England	Sussex	8
O Level Chemistry	Calpac	*
O Level Physics	Think Tank	*
Party Time	C. Tutor	*
Pathfinder	Widget	7
Pirate	Chalksoft	*
Pirate	Chalksoft	7
Quick Thinking	Mirrorsoft	*
Sequences	Chalksoft	5
Spanish Gold	Chalksoft	*
Speak and Spell	S and G	*
Speech Marks	Sinclair	7
Star Reader	Scisoft	*
Teach Data	B Farris	*
Teacher Data	B Farris	8
Tense French	Sulis	7
Time Traveller	Willey	*
Tuner	Soft Cottage	*
Whizz Kid	Comp. Tutor	*
Wizard Box	Scisoft	*

Language

Forth	Melbourne Hse.	9

Forth	Sinclair	7
Micro Prolog	Sinclair	8
Pascal Compiler	Hi-Soft	*
Snail Logo	CP	8
Spec. Forth	Abersoft	9
Spec. Forth	CP	8
ZX Forth	Artic	8

Practical

Beamscan	Beamscan	9
Cricket Averages	Spartan CC	7
Diet	dK' Tronics	*
Diet Master	Diet Master	6
Dietician	Keysoft	4
Engine Diagnostic	Spectrasoft	*
First Aid	Eastmead	4
Football Pools	Hartland	*
How Long have you got?	Eastmead	6
I Ching	Salamander	7
I Ching	Sirius	*
Personal Reminder	SD Micro	*
Star Gazer	CRL	8
The Complete Guide to Medicine	Eastmead	4
Vega-Table	Vega	7
World Info	Wimsoft	*

Puzzle

Arcturus	Visions	7
Computaword	Work Force	2
Hanoi King	Contrast	*
Jumbly	dK' Tronics	*
Mazecube	PAL	6
3D Strategy	Quicksilva	8

Simulation

Fighter Pilot	Digital Int.	*
Flight Simulation	Sinclair	6
Golf	dK' Tronics	*
Inkos	Chalksoft	*
Royal Birkdale	Ocean	*
Strike Attack	Micromart	4
Test Match	Comp. Rentals	*
The Forest	Phipps	*
The Forest	Phipps	7
Troon	Hornby	8

Strategy

Airline	CCS	7
Angler	Virgin	6
Apocalypse	Red Shift	*
Battle 1917	CCS	8
Battle of Britain	Microgame	*
Brewery	CCS	8
British Lowland	CCS	*
Caribbean Trader	E. Midland	7
Conflict	Martech	*
Conquest	Cheetahsoft	6
Derby Day	Comp. Rentals	*
Football Manager	Addictive Gms.	7
Galaxy Conflict	Martech	*
Galaxy Conflict	Martech	8
Gangsters	CCS	*
General Election	Bug-Byte	1
Great Britain Ltd	Hessel	7
Hunter Killer	Protek	9
It's Only Rock 'n' Roll	K-Tel	5
Johnny Reb	Lothlorian	*
King Arthur	E. Midland	*
Millionaire	Incentive	7
1984	Incentive	7
Oligopoly	CCS	7
Plunder	CCS	8
Red Weed	Lothlorian	7
Scatterbrain	Manor	7
Sheepwalk	Virgin	7
Special Operations	Lothorien	8
Stonkers	Imagine	9
Tradewind	WDS	*
War 70	CCS	8
Warlord	Lothlorian	*
Wilfred the Hairy	Microbyte	2

Traditional

Arcturus	Visions	7
Backgammon	CP	7
Brag	T Lebon	7
Bridge Player	CP	8
County Cricket	Allanson	6
Do Not Pass Go	Work Force	6
Draughts	CP	7
Evolution	Microsphere	*
Go To Jail	Automata	*
Grid run/Pontoon	Arcade	*
Original Superchess	CP Software	*
Pontoon	Contrast	3
Ramopoly	J Fletcher	*
Roulette	Dymond	*
Scrabble	Sinclair	8
Snooker	Visions	*
Superchess II	CP	8
Superchess Three	CP	9
The Turk	OCP	8
Voice Chess	Artic	9
Yahtzi	Work Force	*
ZX Draughts	CP	*
ZX-Chess II	Artic	*

Utility

Allsort S-1	A Firminger	7
Assembler	Artic	6
Beyond Basic	Sinclair	*
Cartoon Animation	Fowler	*
Compiler	Softek	6
Composer	Contrast	2
DLAN	Campbell	*
Football	Digital Int.	*
FP Compiler	Softek	9
Games Designer	Quicksilva	7
HURG	Melbourne House	8
Keyword Extension	Timedata	8
List File	SD Micro	*
Melbourne Draw	Melbourne Hse.	7
Monitor/Diss.	Sinclair	8
Music Maker	Bellflower	3
Paintbox	Print & Plotter	8
Print Utilities	Sinclair	7
Quill	Gilsoft	9
Softalk 1-2	CP	8
Spec. Assembler	Artic	*
Spec. Compiler	Softek	7
Spectadraw 2	McAlley	*
Spectrum Extended Basic	CP Software	7
Spectrum Super Toolkit	Nectarine	8
Vu3D	Sinclair	8
Zeus Assembler	Sinclair	9

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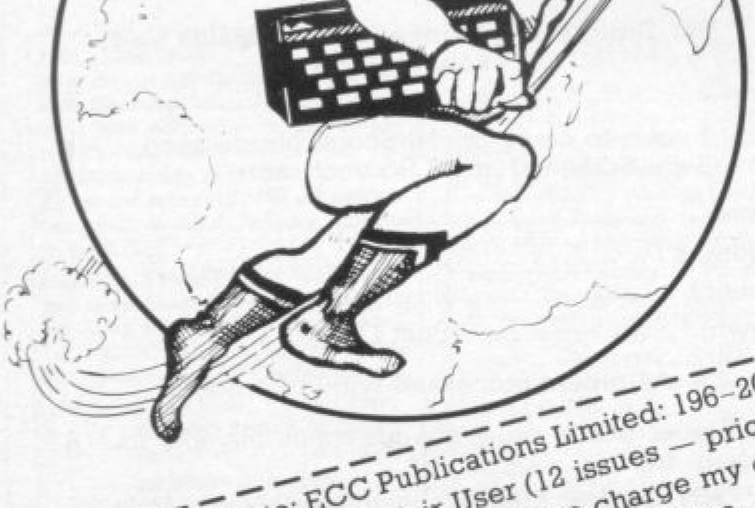
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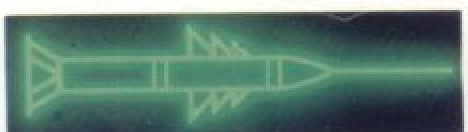


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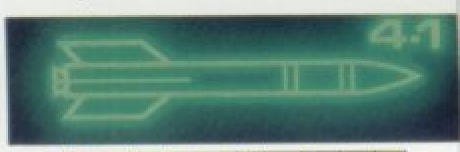
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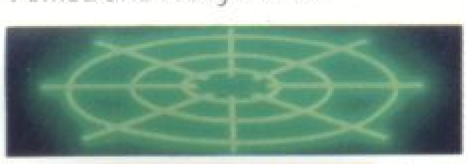
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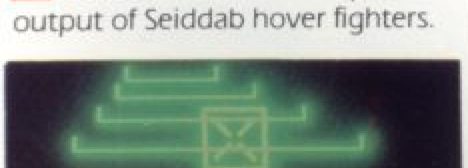
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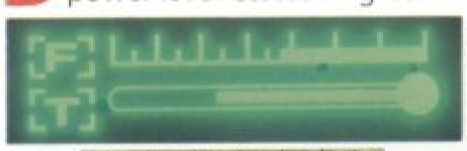
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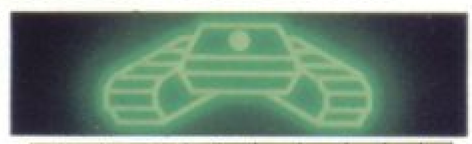
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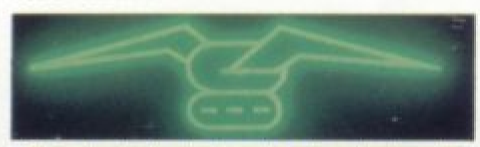
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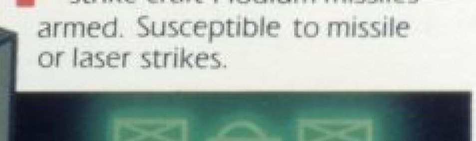
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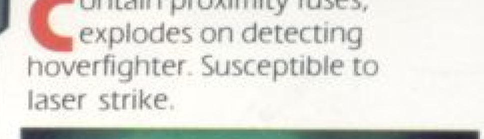
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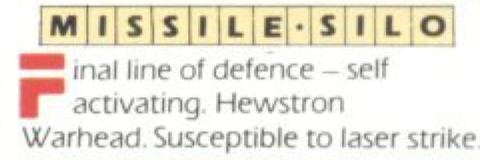
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